A Further Study of Amendment to the UK Fishing Vessel Licensing System : A Capacity Exchange Scheme

MAFF Commission
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March 1989

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SEA FISH INDUSTRY AUTHORITY
Industrial Development Unit

A FURTHER STUDY OF AMENDMENT TO THE UK FISHING VESSEL LICENSING SYSTEM : A CAPACITY EXCHANGE SCHEME

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SUMMARY

1. Following the technical assessment of three proposed amendments to the UK fishing vessel licensing system, undertaken by Seafish at the request of MAFF and reported in TR 344, a further scheme for control of fleet capacity through restrictive licensing has been studied.

2. The three amendments originally proposed by the Fisheries Departments did not reduce capacity to the MAGP targets. The purpose of the further scheme was to see if a measure could be introduced to reduce capacity still more at the time an owner changes from one vessel to another. This scheme is based on the premise that, in order to introduce a new vessel into the fleet, licences of greater vessel capacity must be surrendered. Capacity is measured in terms of a Vessel Capacity Unit (VCU) formulation (VCU = L*B+0.45Kw), and derogation would be given for the direct replacement of a lost vessel.

3. The analyses undertaken suggest that an exchange factor of about 0.5 would produce the greatest fall in fleet capacity, some 1½% in power, and 2-2½% in tonnage, over a 2½ year period.

4. However these reductions, which depend both on strict interpretation and universal application of the scheme, are insufficient to meet the UK MAGP targets. These call for fall of 16% in power, and 19% in tonnage in the three years up to the end of 1991.

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1. INTRODUCTION

1.1
In 1984 the United Kindom introduced a system of restrictive licensing for vessels catching pressure stocks. In 1987 it was announced that the scheme would continue and further work on the measurement of the effective capacity of the UK fleet would be undertaken. The results of this work were communicated in a consultation paper circulated by the Fisheries Departments in July 1988. The paper also suggested three potential schemes to introduce further constraint on the growth of capacity:- (a) closer length bands; (b) a capacity formula; or (c) prohibition on increasing power and tonnage.

1.2
At the request of MAFF an independent technical review of these proposals was undertaken by Seafish IDU, as part of the Chief Scientist's Group R&D Commission ref. JAI 16. This was described in: "Study of Proposed Amendments to the UK Fishing Vessel Licensing System", C.E. Tucker, Seafish Technical Report No. 344, Nov. 1988. This report, which favoured the scheme based on a capacity formula, was presented to a joint meeting of MAFF, DAFS and Seafish officials and others, on 9th January 1989. Its conclusions were discussed with reference to the current situation of the UK fleet vis-a-vis the MAGP targets for the end of 1991. Due to the continued expansion of the

fleet, based on provisional end-1989 figures the reduction required is now 16% in power terms and 19% in tonnage. This is despite the introduction of restrictions on individual vessel tonnage and power increases as from July 1988.

1.3

At that meeting a suggestion which might offer a prospect of some reduction in capacity was made. The suggestion was that, if a vessel were to be introduced into the fleet its capacity, as measured by the VCU formula, could not exceed some factor multiplied by the aggregate capacity of the vessel(s) whose licences were surrendered. A figure for this factor of about 0.8 (80%) was suggested, but it was pointed out that Spain had some time ago implemented a scheme based on tonnage using a factor of 0.5 (50% or 1 for 2).

1.4

On the 10th January, the MAFF Co-project Officer meeting covering this project (among others) was held, where Seafish undertook to give the task of studying the impact of such a capacity exchange scheme a high priority.

1.5

This report is thus solely concerned with estimating the impact of such a scheme, and for further details of the previous analysis conducted the reader is referred to Technical Report No. 344 mentioned above. The scheme studied is described in detail in Section 2, and the model developed to undertake the assessment is described in Section 3 and in greater detail in Appendix IV.

1.6

Much of the data required had already been obtained in the previous study, but additional information on the age of vessels undergoing grant aided re-engining was obtained from Seafish marine survey staff. Also MAFF provided data for the active UK fleet at the end of 1988 (the basis of the MAGP figures) from their own files, and from DAFS and DANI sources. Information on vessel losses (Appendix I) was obtained by reference to earlier analyses conducted by Seafish.

1.7

Data analysis was undertaken using SPSS/PC+ on an MS-DOS microcomputer, while the model of likely fleet development was created using the Excel spreadsheet system mounted on an Apple Macintosh microcomputer. This system was also used for the preparation of the graphs presented in Figures 1 to 12.

2. THE LICENSING SCHEME

2.1 The Basic Scheme

2.1.1

The scheme would aim to further reduce fleet capacity by introducing an exchange factor at the time a new vessel or a second hand vessel was introduced to the fleet. Such a vessel would have to be of a smaller capacity (measured in VCU) than the aggregate of VCU's taken out of the fleet. In other words the owner must use the occasion to demonstrate a capacity reduction by the surrender of licences of greater VCU than the licence required for his new vessel.

2.1.2 Definition of Vessel Capacity Unit

It is assumed throughout this report that the scheme introduced would be based on a vessel capacity unit (VCU) formulation. In this context a VCU is taken to be defined by:

$$VCU = (Length \times Breadth) + (0.45 \times Power)$$

where Length is the vessel's length overall, which, like its Breadth is measured in metres, and Power is the total propulsive shaft power installed on the vessel, and is expressed in kilowatts.

2.1.3 Existing Vessels

Where a vessel, licensed under the new scheme, is transferred to a new owner, its licence may be transferred to that new owner without penalty. That is, the licence is associated more with the boat than with the ownership.

2.1.4 Vessels Entering the Fleet

Vessels entering the fleet, either as new buildings, or second hand purchases from abroad or from non-fishing activities, must not have a capacity exceeding X% of the aggregate VCU of the existing vessel(s) licence(s) surrendered. (The impact of different values of X is discussed in Section 4). This rule would not apply should the vessel be a replacement for a lost vessel, see below (2.16).

2.1.5 Modernised Vessels

Where modernisation involves an increase in either power (e.g. re-engining) or tonnage (e.g. lengthening, shelterdeck), or both, then the increase in capacity due to the modernisation must not exceed X% of the aggregate VCU of the vessel(s) licence(s) surrendered.

2.1.6 Accidental Losses

In the event of an existing vessel becoming a constructive total loss (through collision, fire, stranding, capsize, foundering etc), it may be replaced by a new or second-hand vessel of no greater capacity (as measured by its VCU).

2.1.7 Licence Aggregation

Obviously the above proposals imply that licence aggregation and disaggregation will be permitted. Aggregation in this context means the application of VCU's obtained from the surrender of more than one licence to a single (new) vessel, whereas disaggregation means the converse, viz splitting a single surrendered licence among several vessels.

2.1.8 Scope of Scheme

It has been assumed that all active UK fishing vessels will be subject to licence control, irrespective of size or target species.

2.2 Administrative Considerations

2.2.1 All Vessels

It is obvious that the introduction of a licensing scheme covering all vessels irrespective of size or target species is a departure from the current pressure stock licence (PSL) situation, which for instance, does not extend to many shellfish species, nor to vessels under 10m. There would seem to be no reason why the possession of a general licence to fish (effectively a closed register) should not be a pre-requisite to the issue of such PSL's as may be required. This scheme would therefore then impact directly on the structure of the fleet, rather than leaving open options such as to sell one's licence and switch to shellfish. It would seem inadvisable to introduce a new lower size limit of say 8m, as

this would still leave a sizeable section of the fleet uncontrolled, and would also create further "rule-beating" designs. However the number of vessels covered by the scheme may be minimised by restricting the issue of licences to active vessels only.

2.2.2 Active Vessels

By restricting the issue of new licences to active vessels, a one-to-one correspondence between the fleet as defined for MAGP purposes and the licenced fleet will be ensured. This will overcome the current problem of vessels which are in-active, but either hold pressure stock licences or intend to fish non-pressure stocks, re-joining the MAGP fleet. This type of behaviour is believed to underlie some of the recently observed increase in capacity. Care will be needed in the definition of 'active' for the first issue of new licences, but perhaps a reasonable requirement would be to insist on the production of documentary evidence of commercial fishing income (e.g. tax returns or audited accounts) for those vessels who have not made landings declarations in the recent past.

2.2.3 Surrendered Licences

As it would be possible to maintain a database of both vessels and licences, it should then be possible to identify those vessels who, by virtue of surrendering their licence (by transfer to another owner/vessel), are no longer permitted to fish UK waters. This information could be passed to Fisheries Inspectors, and patrol vessels and aircraft, who, should they observe any such vessel fishing or landing fish, would have prima facie evidence of an offence. It may also be possible to mark the vessel alongside its registration markings, which are considered permanent.

2.2.4 Licence Aggregation

Obviously for an exchange system to operate it must be possible to both aggregate and dis-aggregate licences. Aggregation is necessary to allow, for example, a new vessel to replace an existing one without insisting that the new boat must be smaller. Similarly disaggregation must also be permitted to cater for e.g. re-engining, otherwise the

value of the smallest vessel licences would become relatively inflated. These processes would patently require to be under Fisheries Departments control, who could then ensure that licences were not concentrated in big business hands. However it would seem reasonable to allow organisations such as PO's and Agencies to hold licences for dis-aggregation to provide for their members to modernise their vessels.

2.2.5 In-active Vessels

As part of the process of maintaining control over ownership of licences, it may well be reasonable to revoke a licence if it is not being fished for longer than a specified period, say 12 months. Should the owner of a vessel which has been inactive wish to renew its licence, it might be possible to insist that such a reinstated licence could not be transferred with a control period, again say 12 months. These measures would be intended to prevent hoarding of licences.

2.2.6 Lost Vessels

It should be noted that the derogation permitted for the direct replacement of accidentally lost vessels may encourage scuttling if the monetary value attached to licenced capacity units is sufficiently high. To discourage scuttling it would seem reasonable to restrict the transfer of the replacement vessel's licence to another owner for some control period, say 24 or 36 months.

2.3 Impact of Grant Aid

In order for an exchange system to be effective it is obviously necessary for the industry to continue the introduction of new capacity. To this end, even though grant aid has been shown as likely to have only a secondary effect on investment decisions ("Capital Grant Aid and Fleet Structure: Scottish Inshore Fleet 1986-90", C.E. Tucker & W.E.F. Oakeshott, Seafish Internal Report No. 1314, May 1987), it is probable that it is necessary for it to continue at much the present level. This is especially so in the current situation of reducing income opportunities consequent upon both falling quotas and prices.

3. IMPACT ASSESSMENT

3.1 The Model

3.1.1

In order to numerically assess the impact of the restrictive licensing scheme described in Section 2 above, a simple model of fleet structural change has been created for a range of values of the exchange factor X from 100% down to 30%. An example of this model is shown in Appendix IV, together with a detailed description of the calculations it performs.

3.1.2 Fleet Age

The primary assumption in building this model is that, if the exchange factor is 1.0 (100%), then sufficient new vessels will be introduced into the fleet, and sufficient vessels withdrawn, to maintain both the number of licenced VCU's and the long term average age of the active fleet constant. This latter assumption is the same as that adopted in the previous study (TR 344), where reasonable justification for it was advanced.

3.1.3 Initial Fleet Structure

The initial fleet structure, as shown on Sheet 1 of the model, is derived from information provided by MAFF on the active over 10m UK fleet at the end of 1988. This information included 119 vessels for which the age was unknown, so these have been distributed into each year built in proportion to both the number of vessels and the age squared. This latter assumption has been adopted on the principle that unknown age vessels are most likely to be older vessels. As the information available consisted of power and tonnage (insufficient information is currently available on English vessels to calculate VCU), the ratios of power and tonnage to VCU established before were used to estimate the total VCU for each age of the fleet.

3.1.4 Accidental Losses

As a derogation to the requirement to reduce capacity on licence transfer has been proposed in the case of accidentally lost vessels, the reduction in VCU due to such losses has been assessed prior to any other

calculation of fleet structural change. The calculation is based on a mean loss rate established from 12 recent years data and a distribution with age based on an earlier Seafish analysis (Appendix I). The variables therefore influencing the amount of capacity lost through accident are thus the amount of capacity at risk, and the age of that capacity (generally older vessels are more likely to be lost).

3.1.5 Voluntary Exits

The rate of voluntary exits at each age has been determined both from the proportion of vessels which may be potential licence exchangers (based on the analysis presented in Appendix II), and the rate which maintains the active fleet mean age constant when the exchange factor is 1.0 (see 3.1.2 above). As the value of the exchange factor is reduced, the rate at which licences are surrendered also falls in a manner which reflects the relative performance of old and new vessels. The capacity leaving the fleet at any particular age is therefore the product of the surrender rate, and the capacity of the fleet at the start of the year (less accidental losses).

3.1.6 Re-engining

As with the previous study (TR 344), it has been assumed that demand for re-engining will continue at close to the present rate when the exchange factor is 1.0. It is further assumed that the industry's demand for re-engining will decline in direct proportion to the exchange factor X. In order to distribute this demand across each vessel age, an analysis of the age distribution of recent re-enginings has been undertaken, as described in Appendix III. It is interesting to note that the age of re-engined vessels averages about 15 years.

3.1.7 New Buildings

The amount of capacity introduced in the form of new buildings (subsuming also second-hand purchases) is taken as the sum of the accidentally lost capacity, plus the exchange factor times the total of the capacity released from voluntary exits (after account has been taken of that absorbed by existing vessel re-enginings).

3.1.8 Estimated Power and Tonnage

At the end of each year's calculation of capacity in terms of vessel capacity units, the VCUs are converted into power and tonnage terms using the ratios determined by the previous analysis. They are also brought into line with the 1989 year end estimates using the fleet aggregate power tonnage and VCU figures presented on sheet one of the model (see Appendix IV).

3.2 Results

3.2.1

The results from running the impact model described in section 3.1 above are summarised in Table 1 and Figures 1 and 2. These results are presented in percentage terms because both the initial starting fleet for the scheme cannot be sensibly estimated (increases due to vessels currently under construction, and reductions due to the potential removal of foreign owned vessels fishing under UK flag, are both unknown), and detail information on the under 10m fleet is not available.

3.2.2

The results shown carry a very simple message. If the intention is to reduce the fleet as quickly as possible in an attempt to approach the MAGP target reductions, then the exchange factor would need to be about 0.5 (50% or 1 for 2) to 0.6 (60%). However, over a 2½ year period, the reduction in power which is likely is about 1½%, associated with some 2-2½% reduction in tonnage. These reductions do not compare well with the MAGP targets, which call for a 16% fall in power, and a 19% fall in tonnage.

3.2.3

However, should the intention be to maintain capacity fairly constant in the future, an exchange factor of 0.8 (80%) to 0.85 (85%) is more appropriate. This would hold power level, and is likely to result in a fall in tonnage of around 1½% over a 2½ year period.

3.2.4

It is reasonable to ask why such a small exchange ratio as 1:2, operating under the very tight licensing system described in section 2 above, should create such a slight fall in fleet capacity. The answer is surely that such a scheme does not impact on the great majority of the fleet, who, in any given and relatively short period, neither consider retiring or the purchase of a new built vessel. Furthermore, it must be accepted that, as the exchange factor falls, fewer and fewer owners will be attracted to licence transfer. Indeed, at the extreme, were no transfers at all to be permitted, the fleet size would remain effectively static (assuming lost vessels replaced), although it would then be ageing very rapidly.

4. CONCLUSIONS

4.1

The first, and most obvious conclusion, is that the scheme studied is not likely to produce a fall in capacity sufficient to meet the UK's declared MAGP objectives, at any level of the exchange factor.

4.2

An exchange factor of between 0.5 (50%) and 0.6 (60%) is likely to result in a fall in power of 1½%, and in tonnage of 2-2½%, over a 2½ year period.

4.3

An exchange factor of between 0.8 (80%) and 0.85 (85%) is likely to hold power nearly constant, and result in a fall in tonnage of some 1½% over a 2½ year period.

4.4

The impact has been assessed on the basis that the scheme will be strictly applied to all active UK fishing vessels. Should any derogations be permitted, e.g. vessels under say 8m or fishing non-pressure stocks, then the impact will obviously be diluted.

4.5

It should be noted that the impact of the scheme is smaller than would be expected at first sight. This is because it does not affect the vast majority of the fleet, who are not involved in introducing new vessels. Also as the exchange factor falls it is likely that less owners would participate in the scheme.

TABLE 1

SUMMARY RESULTS FROM IMPACT MODEL

ESTIMATED AGGREGATE POWER (Kw)

Exchange Factor	X%	Initial Power	After 1 Year	After 2 Years	After 3 Years	- After 2.5 Years - Power*	% Change
1.0	100	710322	715410	720275	724923	722599	+1.73
0.9	90	710322	712079	713667	715090	714379	+0.57
0.8	80	710322	709556	708664	707648	708156	-0.30
0.7	70	710322	707758	705091	702323	703707	-0.93
0.6	60	710322	706549	702677	698709	700688	-1.36
0.5	50	710322	706290	702162	697940	700051	-1.45
0.4	40	710322	706643	702865	698992	700929	-1.32
0.3	30	710322	707465	704512	701466	702989	-1.03

ESTIMATED AGGREGATE TONNAGE (GRT)

Exchange Factor	X%	Initial Tonnage	After 1 Year	After 2 Years	After 3 Years	- After 2.5 Years - Tonnage*	% Change
1.0	100	158270	158125	157981	157835	157908	-0.23
0.9	90	158270	157575	156879	156184	156532	-1.10
0.8	80	158270	157182	156094	155006	155550	-1.72
0.7	70	158270	156921	155570	154217	154894	-2.13
0.6	60	158270	156764	155251	153731	154491	-2.39
0.5	50	158270	156839	155394	153937	154666	-2.28
0.4	40	158270	157021	155754	154470	155112	-2.00
0.3	30	158270	157281	156273	155244	155759	-1.59

* By Linear Interpolation

FIGURE 1

Estimated Impact of Scheme on Power

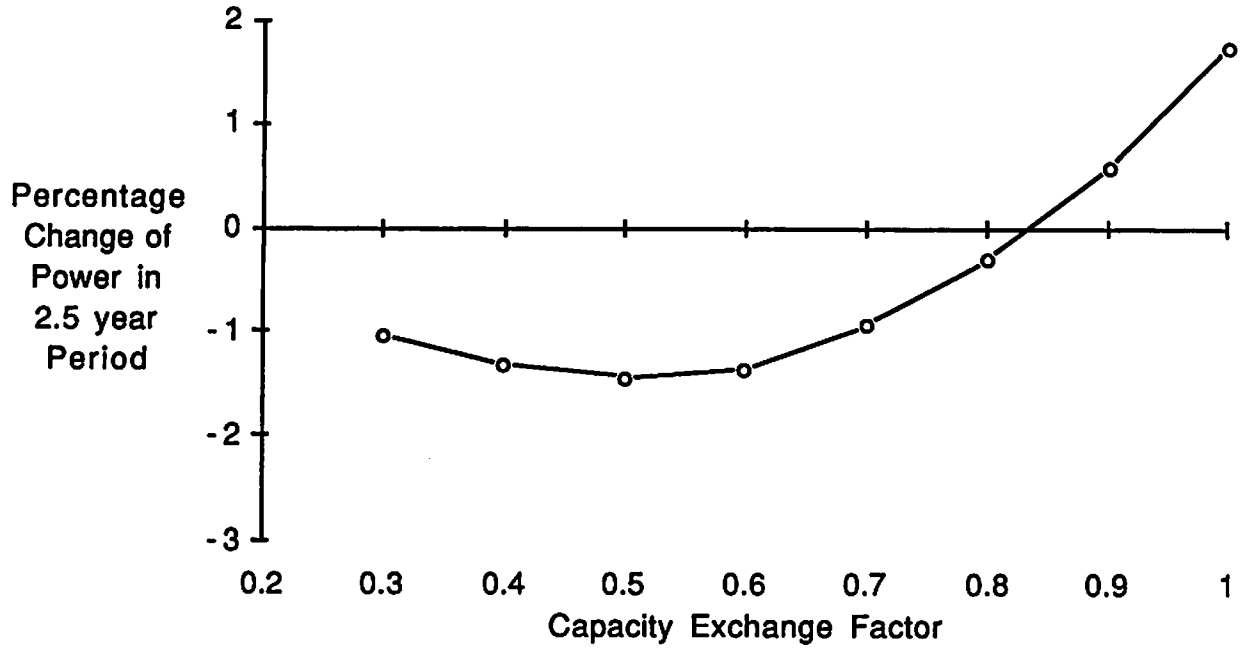
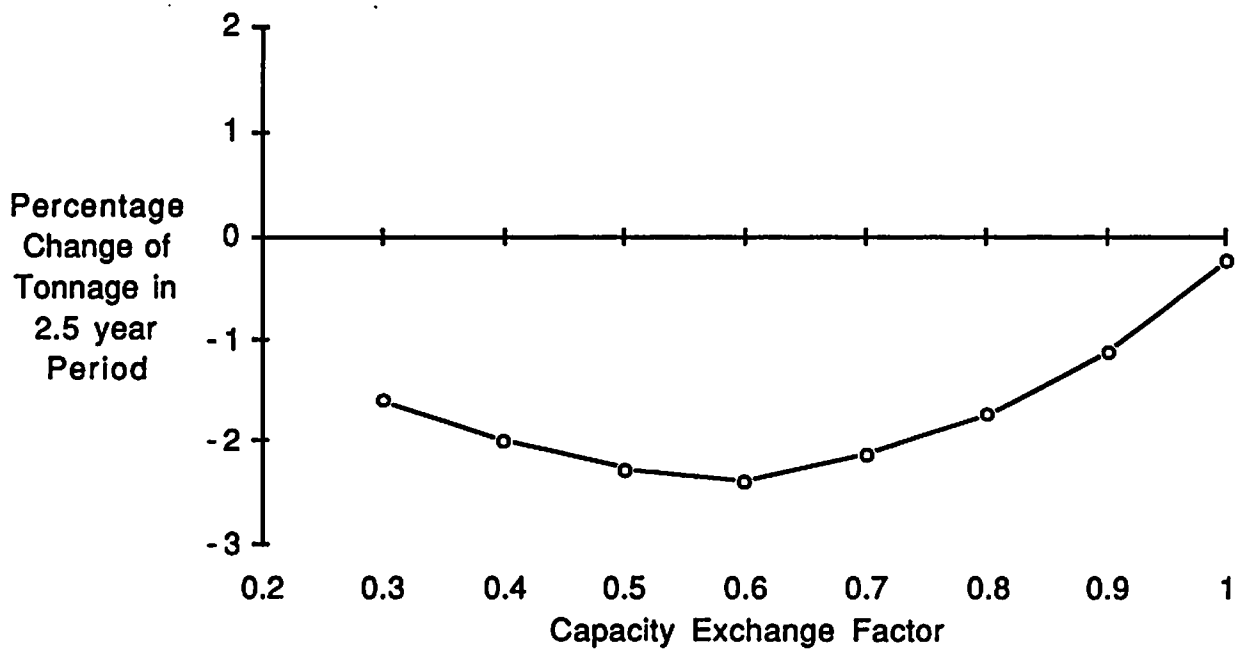


FIGURE 2

Estimated Impact of Scheme on Tonnage



APPENDIX I

ACCIDENTAL LOSS RATE ANALYSIS

CALCULATION OF MEAN ANNUAL LOSS RATE

Data abstracted from "Casualties to Fishing Vessels and Deaths of Fishermen - A Review up to 1985", P.D. Chaplin, Seafish Technical Report No. 295, Dec. 1986:

	Under 12m (40ft)		12m - 24m (40ft - 80ft)		Over 24m (80ft)	
Year	No. Vessels	No. Lost	No. Vessels	No. Lost	No. Vessels	No. Lost
1974	4083	12	2378	10	455	6
1975	4153	11	2139	32	399	4
1976	4307	10	2087	23	346	2
1977	4601	8	2023	21	329	8
1978	4732	3	2033	26	302	9
1979	4878	11	2092	30	272	1
1980	4512	10	2132	29	246	0
1981	4970	24	2136	26	245	2
1982	4485	20	2073	28	239	2
1983	4806	20	1973	20	231	3
1984	5433	20	1934	18	217	3
1985	5400	19	1855	17	199	4
TOTAL	56360	168	24855	280	3480	44

Data from Scottish 1987 Fleet (File MAG87XX):

Mean VCU	86.07	242.93	732.74

Therefore Fleet Loss Statistics in VCU terms:

Under 40ft		40ft - 80ft		Over 80ft	
No. VCU	VCU Lost	No. VCU	VCU Lost	No. VCU	VCU Lost
4851187	14461	6038050	68021	2617959	32241

Total Fleet VCU = 13507196, Total Lost VCU = 114723

Therefore mean annual loss rate (in VCU terms) = 0.0085

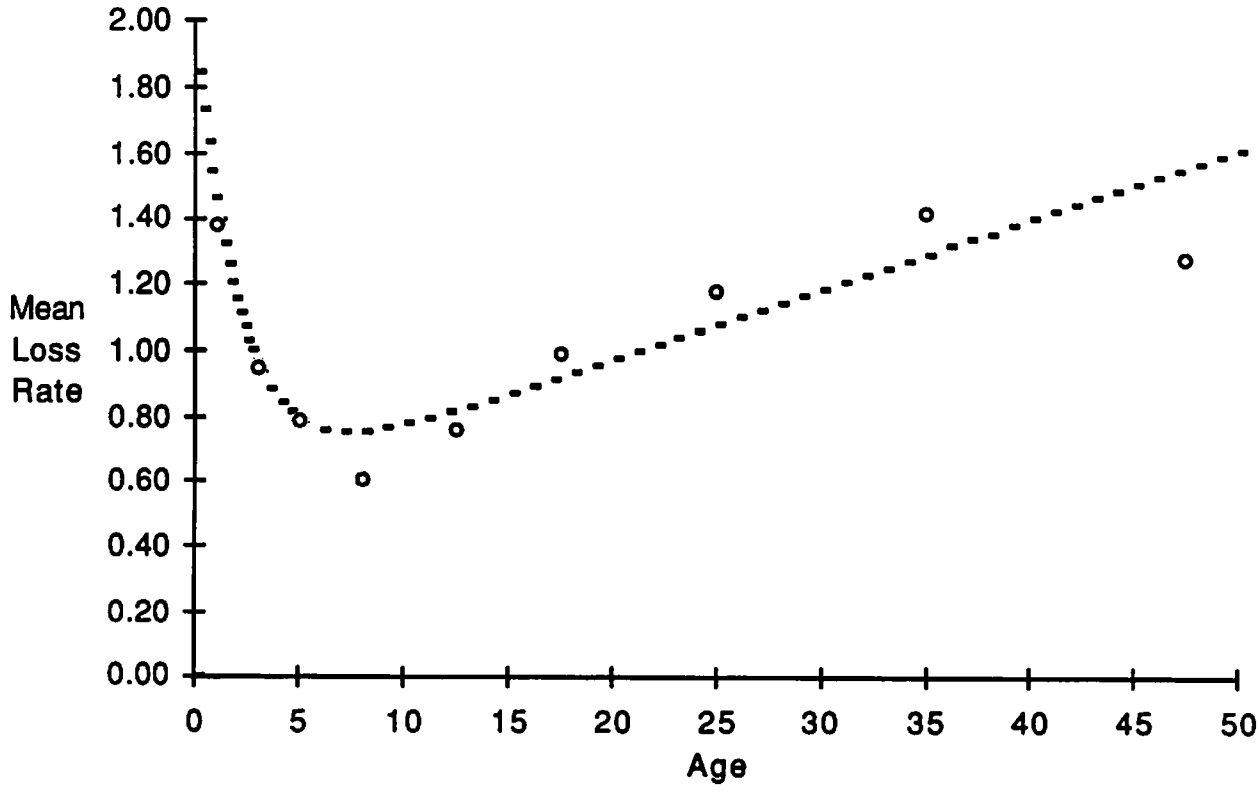
VARIATION OF LOSS RATE WITH AGE

The variation of the loss rate with vessel age has been taken to be the same as that described in "Fleet Structures Model - Vessel Group Structure Phase"", J.A. Shalliker, Seafish Technical Report No. 303 (In Preparation), viz:

Age Loss Factor = (0.556) + (0.0211*Age) + (1.29*Exp(-0.458*Age))

This relationship has been established by performing an analysis of vessel losses (over 40ft) for the period 1976-82 using data abstracted from MAFF and DAFS annual vessel lists and monthly amendments.

The expression contains elements describing the increasing risk of accidental loss with increasing age, but the data also showed an enhanced risk for vessels less than 6 year old, which is incorporated in the negative exponential term.



APPENDIX II

VOLUNTARY EXIT RATE ANALYSIS

VOLUNTARY EXIT RATE ANALYSIS

It is obvious that the driving force behind the exchange of old vessel licences for new capacity will be economic in nature. A full analysis has not been attempted, but, in order to estimate how different levels of the factor influence the rate at which this exchange happens, the following procedure has been adopted.

It has been assumed that the number of vessels willing to retire, would be proportional to the number of vessels in the fleet, which earn less than the exchange factor multiplied by the earnings that would be expected with a new vessel.

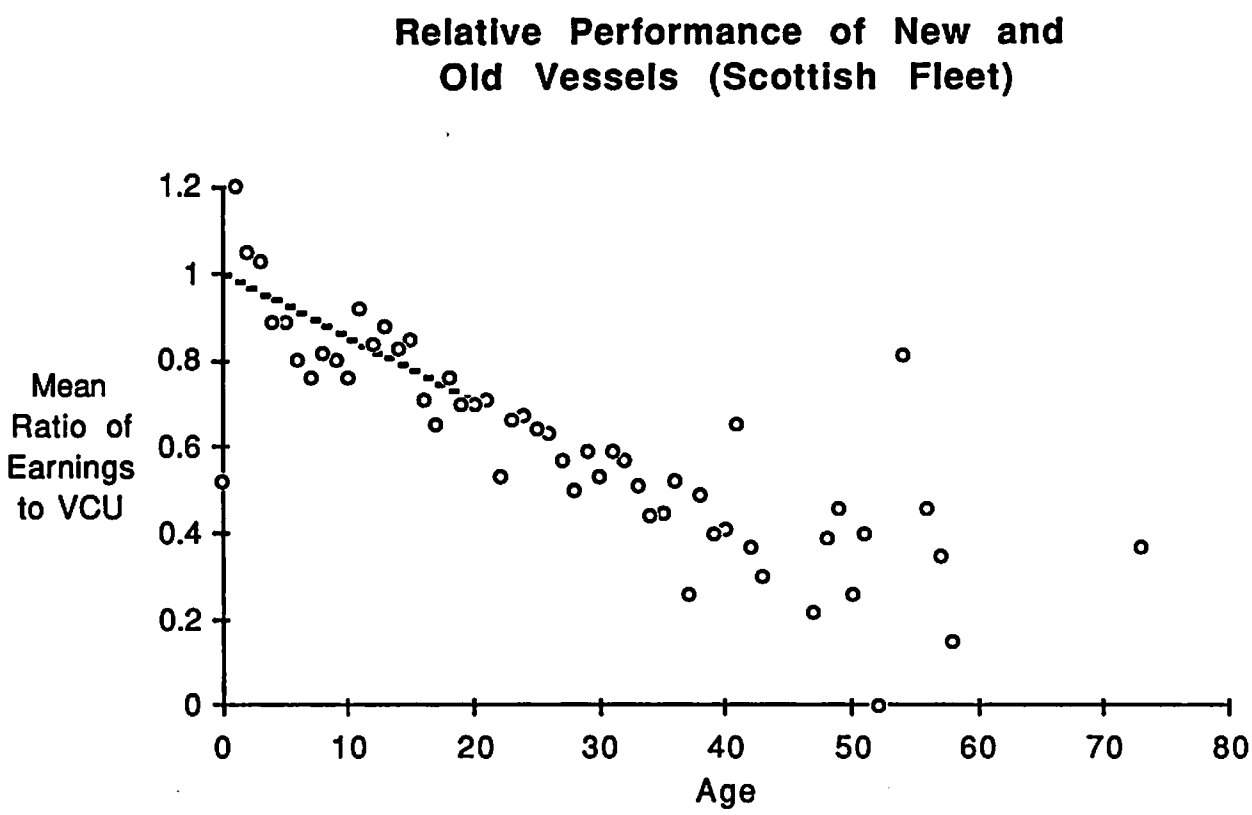
Obviously such exchanges could potentially be of value to the participants, as, in these cases, the earnings of the replacement vessel might be expected to be greater than those of the vessel(s) it displaces.

Figure 3 (overleaf) shows the mean values of the ratio of annual earnings (1987 £000's) to VCU for each age of vessel in the Scottish fleet. Although there is considerable scatter, it may be seen that this ratio approaches the value of one for a newly constructed vessel.

Therefore, the proportion of the fleet for which this ratio is less than one has been determined, again using 1987 Scottish data. The results are shown in Figures 4 to 11.

These show that, as would be expected, the proportion of vessels which might possibly be interested in exchange increases with vessel age, and decreases with the exchange factor. It should be noted that there is but little data for the highest ages.

FIGURE 3


Relative Performance of New and Old Vessels (Scottish Fleet)
Mean Ratio of Earnings to VCU
1.2
1
0.8
0.6
0.4
0.2
0
0
10
20
30
40
50
60
70
80
Age

Linear Regression analysis has been applied to these percentages with the following results (taking age as the independent variable).

Exchange	——Regression——			-Interpolated-	
Factor	Slope	Intercept	R-sq.	Slope	Intercept
1.0	0.865	59.8	0.602	1.2	60.0
	1.258*	52.2*	0.524*		
0.9	1.077	48.0	0.683	1.2	48.6
	1.337*	41.9*	0.577*		
0.8	1.146	38.3	0.515	1.2	38.4
	0.796*	41.0*	0.181*		
0.7	1.241	29.0	0.576	1.2	29.4
0.6	1.281	18.6	0.606	1.2	21.6
0.5	1.329	8.6	0.554	1.0	15.0
0.4	0.975	6.3	0.338	0.8	9.6
0.3	0.581	6.7	0.158	0.6	5.4
0.2	0.115	8.9	0.016	0.4	2.4
0.1	0.169	3.4	0.037	0.2	0.6

* (excluding percent = 100 values)

The lines shown on Figures 4 to 11 overleaf do not correspond exactly to these fitted lines, but to an interpolation, which has been fitted by eye, given by :

Slope = Min (2 * Factor, 1.2)

Intercept = 60 * Factor * Factor

This interpolation has been used in the model described in Appendix IV.

FIGURE 4

Percentage of Vessels with Earnings / VCU less than 100% of that expected of a New Vessel (Scottish Fleet)

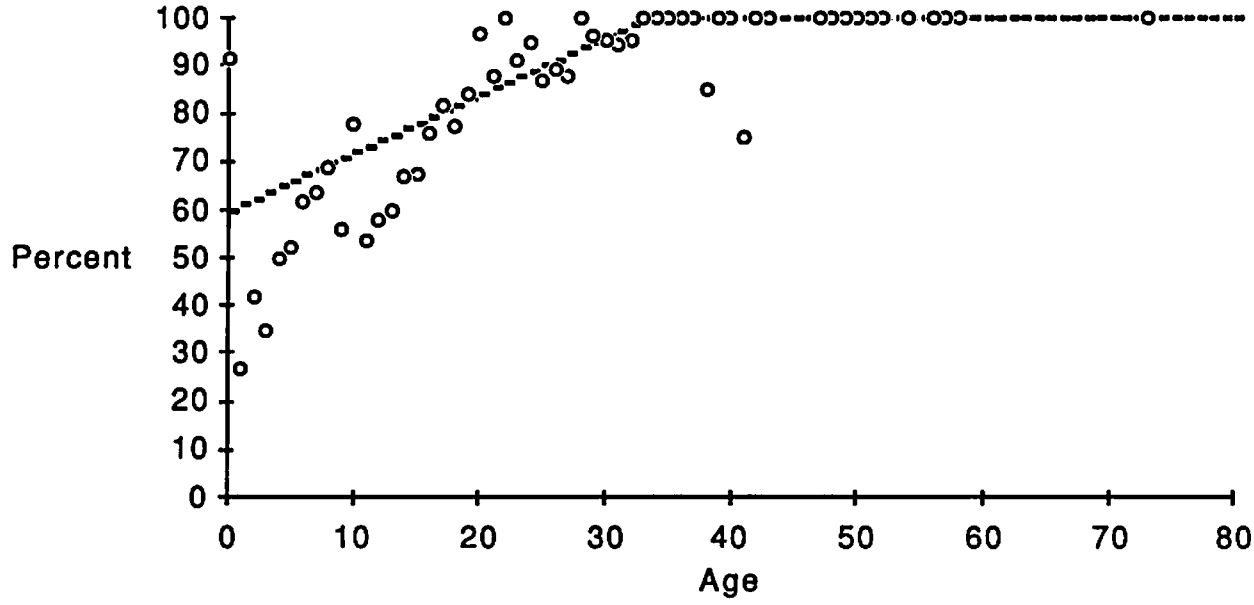


FIGURE 5

Percentage of Vessels with Earnings / VCU less than 90% of that expected of a New Vessel (Scottish Fleet)

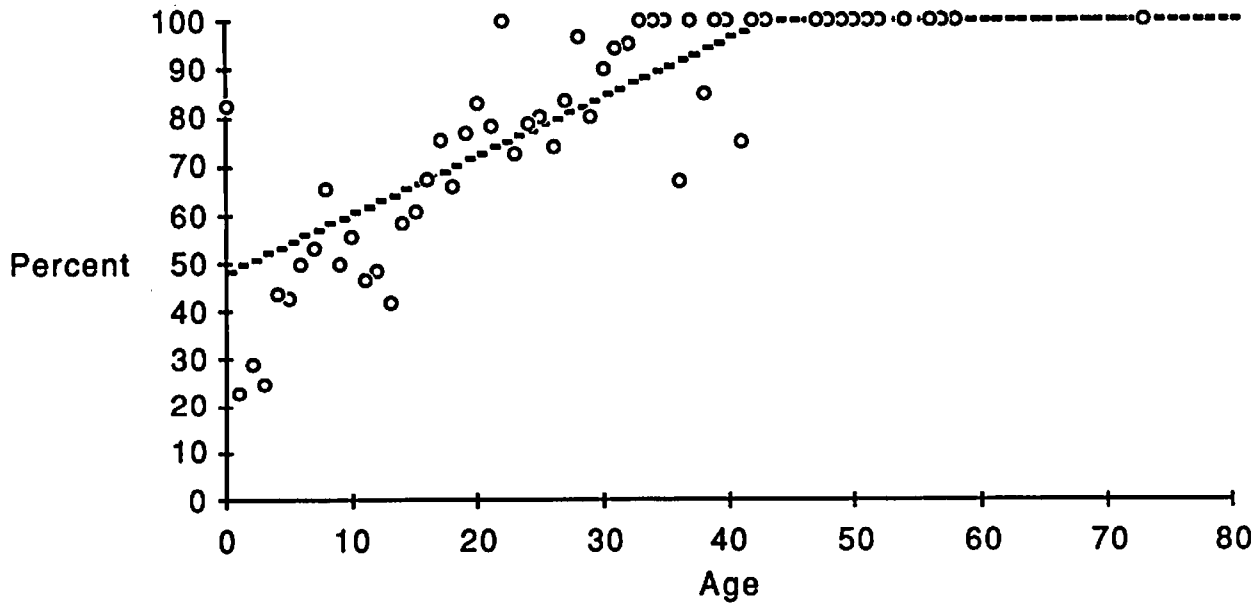


FIGURE 6

Percentage of Vessels with Earnings / VCU less than 80% of that expected of a New Vessel (Scottish Fleet)

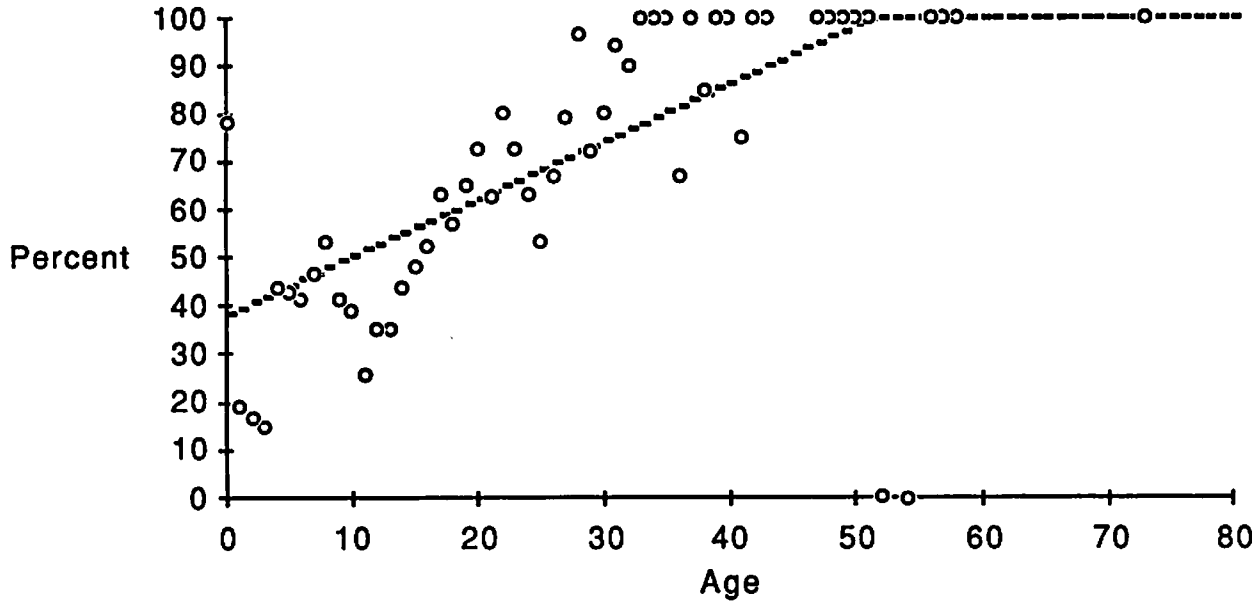


FIGURE 7

Percentage of Vessels with Earnings / VCU less than 70% of that expected of a New Vessel (Scottish Fleet)

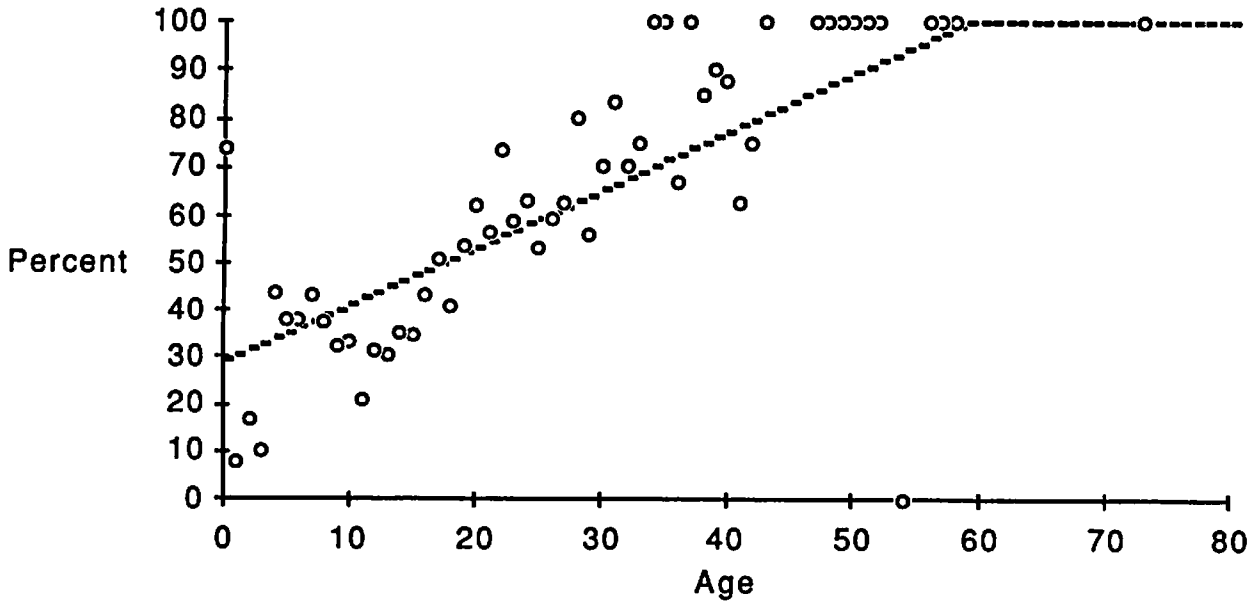


FIGURE 8

Percentage of Vessels with Earnings / VCU less than 60% of that expected of a New Vessel (Scottish Fleet)

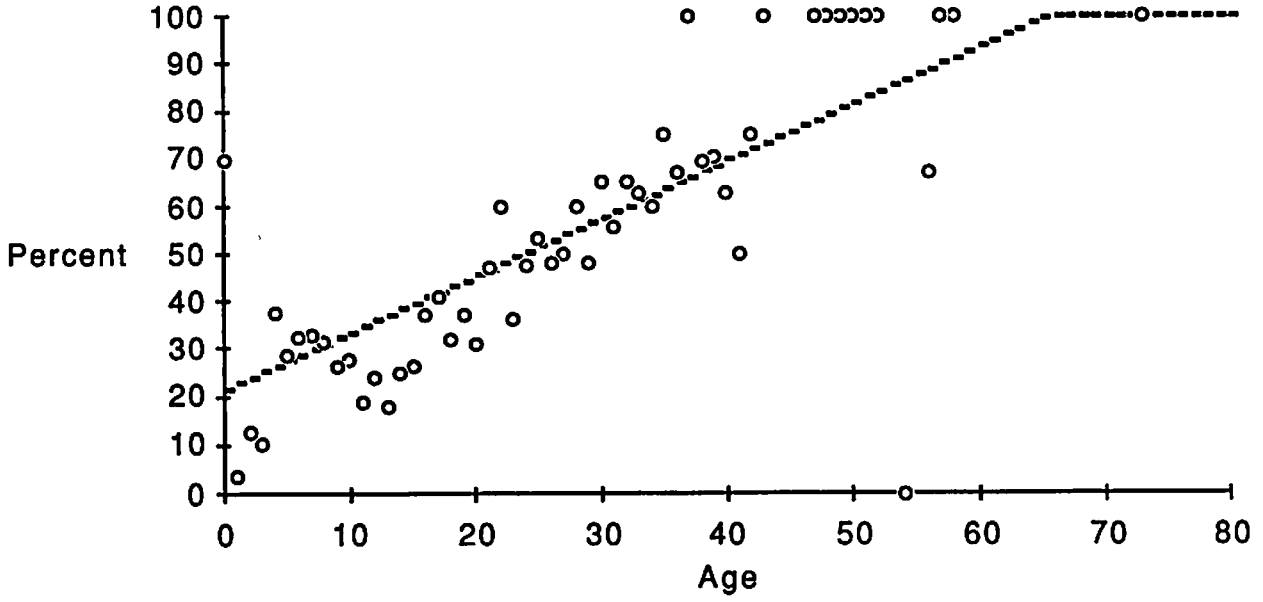


FIGURE 9

Percentage of Vessels with Earnings / VCU less than 50% of that expected of a New Vessel (Scottish Fleet)

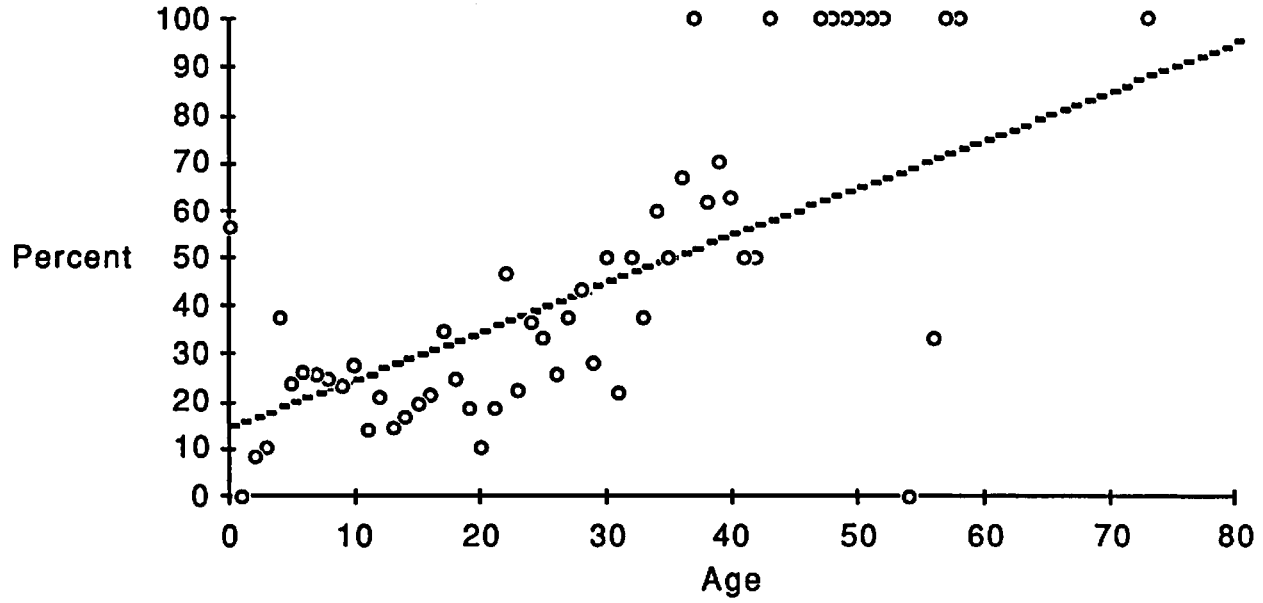


FIGURE 10

Percentage of Vessels with Earnings / VCU less than 40% of that expected of a New Vessel (Scottish Fleet)

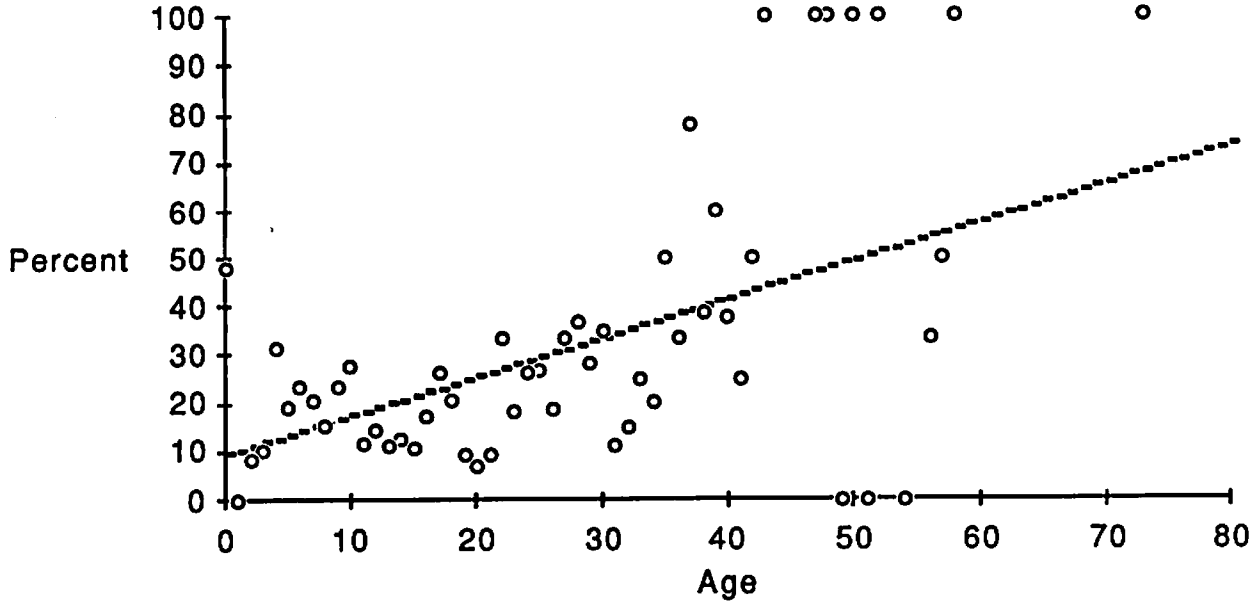
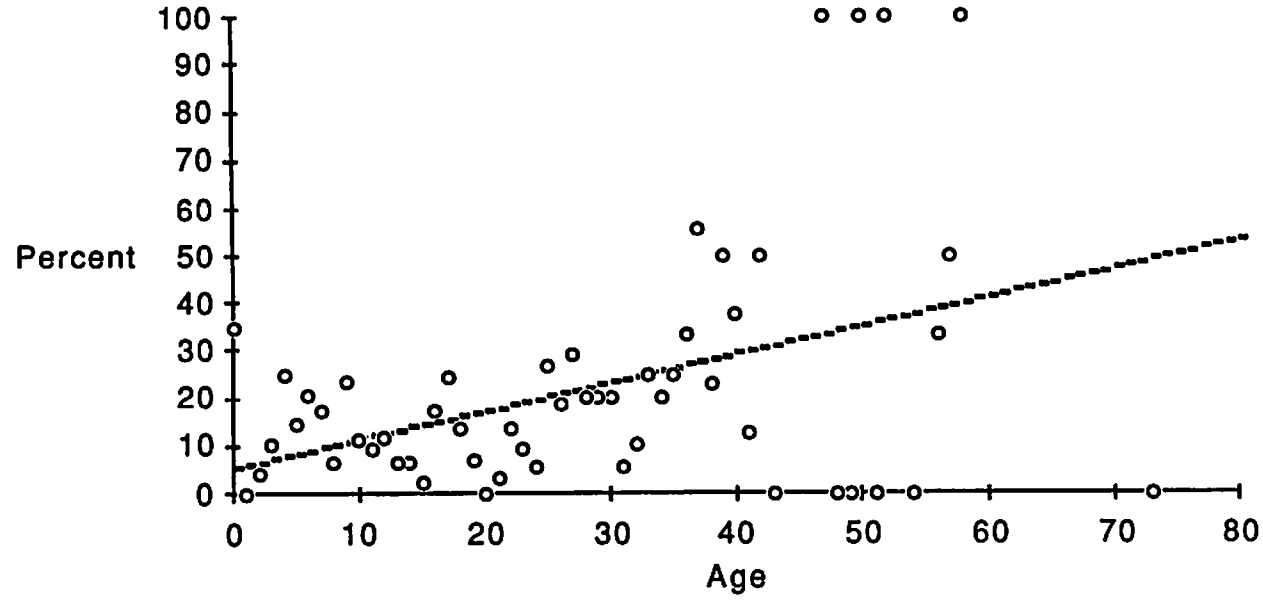


FIGURE 11

Percentage of Vessels with Earnings / VCU less than 30% of that expected of a New Vessel (Scottish Fleet)



APPENDIX III

RE-ENGINING ANALYSIS

AGE DISTRIBUTION OF RE-ENGINED VESSELS

Data on recent re-enginings obtained from Seafish Marine Surveyors:

Vessel Age	No. Re-Engined	Cuml.	Vessel Age	No. Re-Engined	Cuml.
1	3	3	21	2	75
2	3	6	22	4	79
4	1	7	23	1	80
5	5	12	24	1	81
6	1	13	25	1	82
7	7	20	26	1	83
8	4	24	27	3	86
9	2	26	28	3	89
10	2	28	29	6	95
11	2	30	30	1	96
12	8	38	31	2	98
13	7	45	32	1	99
14	8	53	34	1	100
15	4	57	35	2	102
16	2	59	40	3	105
17	5	64	42	1	106
18	3	67	45	1	107
19	3	70	50	1	108
20	3	73	Total	108	-

Fitting a Log-logistic frequency distribution using these data and the method of quantiles as described in "A New Probability Distribution for Fisheries Modelling", C.E. Tucker, Seafish Internal Report No. 1135, Jan. 1984:

$P_1 = 28/108 = 0.2593$, $x_1 = (10+11)/2 = 10.5$

$P_2 = 95/108 = 0.8796$, $x_2 = (29+30)/2 = 29.5$

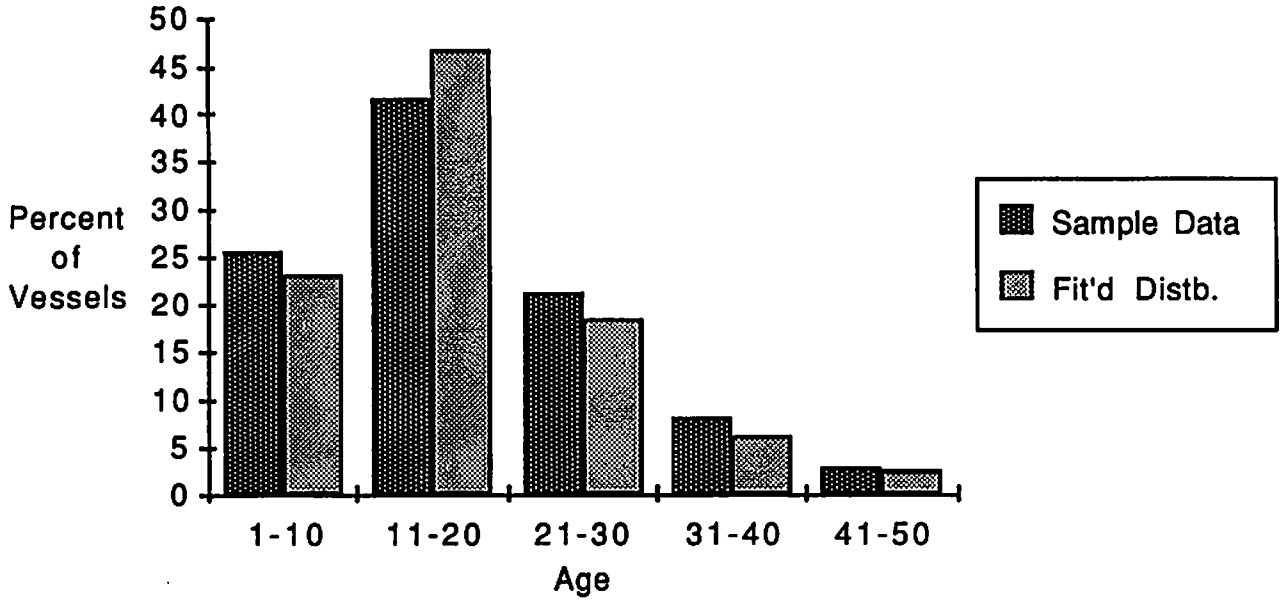
$$n = \log_e \left(\frac{P_1(1-P_2)}{P_2(1-P_1)} \right) / \log_e (x_1/x_2) = 2.941$$

$$a = x \left({}^{1}/_{p} - 1 \right)^{1/n} = 15.00$$

A comparison of the Log-logistic distribution with these parameters, and the original sample data, is given in Figure 12 overleaf.

FIGURE 12

Comparison of Sample Age Distribution of Recently Re-Engined Vessels and Fitted Log-Logistic Distribution



APPENDIX IV

IMPACT MODEL

IMPACT MODEL

DESCRIPTION OF EXCEL ALGORITHM

Sheet 1

1. The number of boats, and their aggregate power and tonnage for England and Wales, Scotland, and Northern Ireland (for each year built) = Data Entry.

2. UK total number, total power and total tonnage (for each year built) = Sum (E. & W., Scot. and N.I.).

3. Factor (for re-distribution of year built = 0, viz. unknown age, vessels)

   = Factor * ((1 - Total UK Redistributed/Total UK Original)/1000)

4. Redistributed No. of Vessels (total UK)

   = 0 if year built = 1900, otherwise;
   = Original No. + Original N. * Age*Age*Factor Number

5. Factor (for re-distribution of year built = 0 power)
   = Factor * ((1 - Total Power Redist./Total Power Orig.)/1000)

6. Redistributed Power (total UK)

   = 0 if year built = 1900, otherwise
   = Orig. Power + Orig. Power*Age*Age*Factor (Power)

7. Factor (for redistribution of year built = 0 tonnage)

   = Factor * ((1 - Total Tonnage Redist./Total Tonnage Orig)/1000)

8. Redistributed Tonnage (total UK)

   = 0 if year built = 1900, otherwise;

   = Orig. Tonnage + Orig Tonnage*Age*Age*Factor (Tonnage)

9. Kw/VCU =

   Min (1.18, (yr. Built - 1900)*0.01138 + 0.25316)

10. GRT/VCU =

    Max. (0.18943, (yr. Built - 1900)*-0.00018 + 0.20661)

    (Note these two sets of co-efficients are those established in the original study, and reported in Appendix III of TR 344).

11. VCU (Kw base) = UK Redist. Kw/(Kw/VCU)

12. VCU (GT base) = UK Redist. GRT/(GRT/BCU)

13. Total VCU = (VCU/Kw base) + VCU (GT base))/2

14. Age Calc. = Total VCU*Max. (1988-Yr. Built, 0)

15. Total (at bottom of sheet) =

    Sum (Respective Column)

16. Mean Age = Sum (Age Calc.)/Sum(Total VCU)

Sheet 2 et seq.

1. YEAR = Previous Year + 1

2. FACTOR = Data Input

3. Age = Max. (YEAR-Year Built, 0)

4. Init. Fleet VCU = Previous Year's Calculated VCU

5. Mean Loss Rate (MLR) = Data Input (0.0085)
(see Appendix I)

6. Constructive Total Los (CTL) Rate

= (0.556 + (0.021lxAge) + (1.29*EXP(-0.458*Age)))*MLR
(See Appendix I)

7. CTL VCU

= CTL Rate * Init. Fleet VCU

8. Mean Exit Rate (MER)

= MER - (1 - Mean Age 1997/Mean Age 1988)/10,
if FACTOR - 1, otherwise

= 0.05144 (the value found from the FACTOR = 1 calculation)

9. Voluntary Exit Rate

= MER * MIN(100,(60*FACTOR*FACTOR*Age&MIN(2*FACTOR,1.2)))/100
(See Appendix II).

10. Vol. Exit VCU

= Vo. Exit Rate* (Init. Fleet VCU - CTL VCU)

11. Re-Engining Req'd.

    = FACTOR * 2785.

12. Mean Re-Eng. Rate (MRR)

    = MRR + (1-Total Re-Eng. VCU/Re.Eng. Req'd)/20

13. a = Data Entry (15)

14. n = Data Entry (2.941)

15. Re-Eng. Req'd. Rate

    = ((1-1/(1+(Age/a)**n))-(1-1/(1+((Age-1)/a)**n))) * MRR
    (See Appendix III)

16. Re-Eng. Req'd. VCU

    = Re-Eng. Rate * Init VCU

17. Re-Eng. Absorbed VCU

    = Re-Eng. Req'd.VCU/FACTOR

18. New Build Available VCU

    = Vol. Exits VCU - Re-Eng. Absorbed VCU

19. New Build Actual VCU

    = Sum (CTL VCU) + FACTOR * Sum (New Build Available VCU)

20. Revised Total VCU

    = (Init. Fleet VCU) - (CTL VCU) - (Vol. Exit VCU)
      + (Re-Eng. Req'd. VCU) + (New Build Act. VCU)

21. Age Calc. = Revised Total VCU * Age

22. Mean Age = Sum (Age Calc)/Sum (Revised Total VCU)

23. 1988 Total Power

= 1988 VCU * (Kw/VCU (Sheet 1))
* Sum (VCU (Kw base, Sheet 1))/Sum (Total VCU (sheet 1))

24. 1988 Total Tonnage

= 1988 VCU * (GRT/VCU (Sheet 1))
* Sum (VCU (GT base, Sheet 1))/Sum (Total VCU (Sheet 1))

25. Total Power (for year under consideration)

= Rev. Total VCU * (Kw/VCU (Sheet 1))
* Sum (VCU (Kwbase, Sheet 1))/Sum (Total VCU (Sheet 1))

26. Total Tonnage (for year under consideration)

= Rev. Total VCU * (GRT/VCU (Sheet 1))
* Sum (VCU(GT base, Sheet 100/Sum(Total VCU(Sheet 1))

27. TOTAL (at bottom of sheet) =

SUM (Respective Column)

																0.2532	0.2066					
											Factor	6E-05	6E-05	6E-05		0.0114	-2E-04					
																1.16	0.1894					
	E&W over 10 m			Scot over 10M			N.I. over 10m			UK Total over 10 m			UK Redist Year-0			Kw /	GRT /	VCU	VCU	TOTAL	Age
Yr bt	No.	Kw	GRT	No.	Kw	GRT	No.	Kw	GRT	No.	Kw	GRT	No.	Kw	GRT	VCU	VCU	(Kw base)	(GT base)	VCU	Calc
1900	105	15791	3802	14	1874	256	0	0	0	119	17665	4058	0	0	0	0.25	0.21	0	0	0	0
1901	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.26	0.21	0	0	0	0
1902	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.28	0.21	0	0	0	0
1903	1	71	8	0	0	0	0	0	0	1	71	8	1	102	11	0.29	0.21	355	55	205	17427.2
1904	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.30	0.21	0	0	0	0
1905	1	59	16	0	0	0	0	0	0	1	59	16	1	84	22	0.31	0.21	269	109	189	15708
1906	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.32	0.21	0	0	0	0
1907	2	144	44	0	0	0	0	0	0	2	144	44	3	201	61	0.33	0.21	604	296	450	36473.8
1908	1	38	9	0	0	0	0	0	0	1	38	9	1	53	12	0.34	0.21	153	60	107	8535.03
1909	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.36	0.20	0	0	0	0
1910	1	15	7	0	0	0	0	0	0	1	15	7	1	21	9	0.37	0.20	56	46	51	3988.08
1911	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.38	0.20	0	0	0	0
1912	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.39	0.20	0	0	0	0
1913	4	283	44	1	40	9	0	0	0	5	323	53	7	433	70	0.40	0.20	1079	345	712	53414
1914	1	29	7	1	26	12	0	0	0	2	55	19	3	73	25	0.41	0.20	178	123	150	11119.1
1915	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.42	0.20	0	0	0	0
1916	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.44	0.20	0	0	0	0
1917	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.45	0.20	0	0	0	0
1918	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.46	0.20	0	0	0	0
1919	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.47	0.20	0	0	0	0
1920	3	88	30	0	0	0	0	0	0	3	88	30	4	113	38	0.48	0.20	234	188	211	14358.8
1921	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.49	0.20	0	0	0	0
1922	1	110	25	0	0	0	0	0	0	1	110	25	1	139	31	0.50	0.20	276	155	216	14230.2
1923	1	10	8	0	0	0	0	0	0	1	10	8	1	13	10	0.51	0.20	24	49	37	2396.49
1924	1	24	12	1	59	12	0	0	0	2	83	24	3	104	30	0.53	0.20	197	147	172	11015
1925	1	88	12	0	0	0	0	0	0	1	88	12	1	109	15	0.54	0.20	203	73	138	8707.56
1926	1	66	8	0	0	0	0	0	0	1	66	8	1	81	10	0.55	0.20	148	49	98	6104.43
1927	2	150	28	0	0	0	0	0	0	2	150	28	2	184	34	0.56	0.20	328	169	249	15174.2
1928	1	59	6	0	0	0	0	0	0	1	59	6	1	72	7	0.57	0.20	126	36	81	4856.88
1929	2	434	62	2	106	21	0	0	0	4	540	83	5	655	100	0.58	0.20	1122	497	810	47766.3
1930	6	412	59	3	185	39	0	0	0	9	597	98	11	719	117	0.59	0.20	1210	584	897	52022.5
1931	3	312	108	5	212	64	0	0	0	8	524	172	10	628	205	0.61	0.20	1036	1020	1028	58596.5
1932	3	287	44	2	99	28	0	0	0	5	386	72	6	460	85	0.62	0.20	745	425	585	32758.2
1933	5	435	61	1	82	24	0	0	0	6	517	85	7	613	100	0.63	0.20	974	499	737	40526.2
1934	9	846	149	1	117	21	0	0	0	10	963	170	12	1135	199	0.64	0.20	1773	994	1383	74708.3
1935	3	265	71	2	112	29	0	0	0	5	377	100	6	442	117	0.65	0.20	678	582	630	33401.4
1936	4	311	83	1	110	18	0	0	0	5	421	101	6	491	117	0.66	0.20	740	586	663	34471.9
1937	5	456	77	1	81	13	0	0	0	6	537	90	7	623	104	0.67	0.20	923	520	721	36795.3
1938	6	483	88	1	49	12	0	0	0	7	532	100	8	614	115	0.69	0.20	895	575	735	36744.1
1939	4	526	124	2	229	56	0	0	0	6	755	180	7	866	206	0.70	0.20	1243	1030	1137	55696.4
1940	3	229	40	2	139	37	0	0	0	5	368	77	6	420	88	0.71	0.20	593	439	516	24769.3
1941	4	441	89	1	88	19	0	0	0	5	529	108	6	601	122	0.72	0.20	835	613	724	34031.1
1942	12	1176	318	1	44	7	0	0	0	13	1220	325	15	1379	366	0.73	0.20	1886	1839	1862	85662
1943	7	691	183	0	0	0	1	152	33	8	843	216	9	948	242	0.74	0.20	1277	1217	1247	56119.3
1944	14	1468	371	1	84	25	0	0	0	15	1552	396	17	1737	442	0.75	0.20	2304	2223	2264	99809
1945	9	726	178	4	320	97	0	0	0	13	1046	275	15	1165	305	0.77	0.20	1523	1538	1531	65814.5
1946	17	2068	564	9	939	259	1	149	36	27	3156	859	30	3500	950	0.78	0.20	4506	4788	4647	195185
1947	30	2501	580	10	1137	251	6	903	238	46	4541	1089	51	5013	1177	0.79	0.20	6362	5938	6150	252139
1948	20	2154	450	13	1188	300	8	931	268	41	4273	1018	45	4696	1116	0.80	0.20	5875	5635	5755	230203
1949	18	1460	397	17	1568	369	9	1423	330	44	4451	1096	48	4871	1196	0.81	0.20	6007	6047	6027	235062
1950	27	2883	605	9	1051	214	5	692	178	41	4626	995	45	5041	1081	0.82	0.20	6131	5472	5802	220459
1951	7	1101	215	4	276	56	1	113	25	12	1490	296	13	1617	320	0.83	0.20	1940	1623	1781	65905.5
1952	6	782	193	4	479	125	1	134	45	11	1395	363	12	1508	391	0.84	0.20	1784	1984	1884	67829.2
1953	13	1617	329	4	510	132	1	310	66	18	2437	527	19	2623	566	0.86	0.20	3063	2872	2968	103867
1954	28	2700	829	9	988	278	10	2151	505	47	5839	1612	51	6261	1725	0.87	0.20	7215	8759	7987	271571
1955	23	3551	839	20	2595	618	4	759	188	47	6905	1645	50	7375	1753	0.88	0.20	8390	8914	8652	285519
1956	31	4677	1133	18	2319	610	12	2141	509	61	9137	2252	65	9723	2392	0.89	0.20	10920	12171	11545	369448
1957	36	6104	1770	20	2769	859	13	2597	556	69	11470	3185	73	12162	3371	0.90	0.20	13486	17169	15327	475152
1958	37	5026	1166	22	2794	758	11	1805	480	70	9625	2404	74	10170	2536	0.91	0.20	11137	12927	12032	360950
1959	47	7253	2182	28	4371	994	9	1951	358	84	13575	3534	89	14295	3715	0.92	0.20	15461	18957	17209	499068
1960	58	10731	3449	26	5407	1056	14	2265	546	98	18403	5081	101	19315	5293	0.94	0.20	20637	27033	23835	667377
1961	35	10918	3937	31	5842	1016	8	1653	352	74	18413	5305	78	19264	5542	0.95	0.20	20335	28330	24333	656978
1962	30	5926	1557	17	2358	482	2	483	76	49	8767	2117	51	9144	2205	0.96	0.20	9537	11282	10410	270650
1963	22	6349	2787	18	2298	459	4	929	204	44	9576	3450	46	9958	3583	0.97	0.20	10264	18349	14307	357670
1964	27	6498	1218	25	5070	1041	1	298	66	53	11866	2325	55	12303	2408	0.98	0.20	12535	12343	12439	298533
1965	37	9461	3030	16	2229	498	6	1503	326	59	13193	3854	61	13641	3981	0.99	0.19	13739	20423	17081	392862
1966	25	5231	1197	33	8411	1793	6	1938	429	64	15580	3419	66	16066	3522	1.00	0.19	15998	18088	17043	374940
1967	37	9580	2093	33	6561	1270	4	1149	270	74	17290	3633	76	17783	3733	1.02	0.19	17510	19189	18350	385341
1968	44	13368	2882	46	8671	1701	11	3219	686	101	25258	5269	104	25914	5402	1.03	0.19	25233	27790	26512	530233
1969	39	10157	2455	48	9340	1871	7	1686	241	94	21183	4567	96	21682	4671	1.04	0.19	20881	24055	22468	426891
1970	38	6815	1373	54	12532	2332	3	862	116	95	20209	3821	97	20639	3900	1.05	0.19	19681	20100	19881	357850
1971	40	8835	2237	56	12859	2372	4	1149	246	100	22843	4855	102	23279	4945	1.06	0.19	21938	25511	23724	403313
1972	43	11503	3003	54	12791	2546	3	877	198	100	25171	5747	102	25000	5842	1.07	0.19	23869	30167	27018	432283
1973	52	19649	5046	64	16717	2920	2	444	67	118	36810	8033	120	37365	8150	1.08	0.19	34473	42127	38300	574501
1974	44	16174	3547	73	22452	4091	2	1344	298	119	39970	7936	121	40500	8038	1.10	0.19	36977	41584	39281	549930
1975	45	18051	4565	87	33847	6751	19	6648	1704	151	58546	13020	153	59222	13166	1.11	0.19	53514	68177	60846	790992
1976	21	4945	1060	45	17569	3753	6	1619	369	72	24133	5182	73	24373	5232	1.12	0.19	21800	27118	24459	293511
1977	26	3091	545	17	6874	1301	0	0	0	43	9965	1847	43	10050	1862	1.13	0.19	8898	9661	9280	102075
1978	35	3738	534	37	19437	4461	3	1167	319	75	24342	5314	76	24516	5351	1.14	0.19	21490	27786	24638	246377
1979	46	7482	954	37	12758	2244	4	2984	633	87	23224	3831	88	23361	3853	1.15	0.19	20275	20026	20151	181357
1980	44	4930	745	65	23950	4460	2	724	132	111	29604	5337	112	29745	5362	1.16	0.19	25564	27895	26729	213836
1981	32	3228	499	38	10842	1647	2	619	117	72	14689	2263	72	14744	2271	1.17	0.19	12549	11626	12188	85316.5
1982	34	4297	666	28	6238	1045	0	0	0	62	10535	1713	62	10565	1718	1.18	0.19	8954	8954	8954	53722.7
1983	21	3274	501	23	5586	952	0	0	0	44	8860	1453	44	8879	1456	1.18	0.19	7524	7596	7560	37801.8
1984	26	3857	578	23	7516	1397	0	0	0	49	11373	1975	49	11390	1978	1.18	0.19	9652	10329	9990	39961.8
1985	14	1771	270	30	8996	1653	3	359	67	47	11126	1990	47	11136	1992	1.18	0.19	9436	10411	9925	29773.7
1986	16	3179	713	30	10713	1859	8	2272	514	54	16164	3086	54	16173	3088	1.18	0.19	13706	16154	14930	29859.9
1987	14	6495	2007	32	14300	2952	5	403	65	51	21198	5024	51	21203	5025	1.18	0.19	17969	26317	22143	22142.6
1988	12	5033	1491	24	13524	4325	5	6002	3105	41	24559	8921	41	24560	8922	1.18	0.19	20814	46766	33790	0
1989																1.18	0.19	0	0	0	0
1990																1.18	0.19	0	0	0	0
1991																1.18	0.19	0	0	0	0
1992																1.18	0.19	0	0	0	0
1993																1.18	0.19	0	0	0	0
1994																1.18	0.19	0	0	0	0
1995																1.18	0.19	0	0	0	0
1996																1.18	0.19	0	0	0	0
1997																1.18	0.19	0	0	0	0
TOTAL	1521	294966	72365	1344	352728	70870	226	56807	14961	3091	706501	158196	3091	706501	158196			662002	815728	748865	1.4E+07

Mean Age 18.07

SECOND LICENSING SCHEME IMPACT MODEL

SHEET 2

							Re-Eng rq	1393									
YEAR	1989		M.Loss.Rt	0.0085	M.ExitRt	0.05144	M.Eng.Rt	0.06483									
FACTOR	0.50						'a'	15									
							'n'	2.941	Re-Eng	New Build	New Build	Revised		1988	1988	1989	1989
		Init Fleet	Constr. Total Loss		Voluntary Exits		Re-Eng Required		Absorbed	Available	Actual	Total	Age	TOTAL	TOTAL	TOTAL	TOTAL
Year Built	Age	No.VCU	Rate	VCU	Rate	VCU	Rate	VCU	VCU	VCU	VCU	VCU	Calc	POWER	TONNAGE	POWER	TONNAGE
1900	89	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1901	88	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1902	87	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1903	86	205	0.020	4	0.05	10	0.000	0	0	10		191	16388	54	46	50	43
1904	85	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1905	84	189	0.020	4	0.05	9	0.000	0	0	9		176	14789	53	42	50	39
1906	83	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1907	82	450	0.019	9	0.05	22	0.000	0	0	22		420	34401	136	101	127	94
1908	81	107	0.019	2	0.05	5	0.000	0	0	5		99	8057	33	24	31	22
1909	80	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1910	79	51	0.019	1	0.05	2	0.000	0	0	2		48	3771	17	11	16	11
1911	78	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1912	77	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1913	76	712	0.018	13	0.05	33	0.000	0	0	33		666	50647	260	158	243	148
1914	75	150	0.018	3	0.05	7	0.000	0	0	7		141	10552	56	33	53	31
1915	74	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1916	73	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1917	72	0	0.018	0	0.04	0	0.000	0	0	0		0	0	0	0	0	0
1918	71	0	0.017	0	0.04	0	0.000	0	0	0		0	0	0	0	0	0
1919	70	0	0.017	0	0.04	0	0.000	0	0	0		0	0	0	0	0	0
1920	69	211	0.017	4	0.04	9	0.000	0	0	9		199	13702	92	47	87	44
1921	68	0	0.017	0	0.04	0	0.000	0	0	0		0	0	0	0	0	0
1922	67	216	0.017	4	0.04	9	0.000	0	0	9		203	13605	99	46	93	45
1923	66	37	0.017	1	0.04	2	0.000	0	0	2		35	2293	17	8	16	8
1924	65	172	0.016	3	0.04	7	0.000	0	0	7		162	10551	82	38	78	36
1925	64	136	0.016	2	0.04	6	0.000	0	0	6		130	8349	66	30	64	29
1926	63	96	0.016	2	0.04	4	0.000	0	0	4		93	5859	49	22	47	20
1927	62	249	0.016	4	0.04	10	0.000	0	0	10		235	14578	127	55	120	52
1928	61	81	0.016	1	0.04	3	0.000	0	0	3		77	4671	42	18	40	17
1929	60	810	0.015	13	0.04	31	0.000	0	0	31		766	45981	430	176	407	168
1930	59	897	0.015	14	0.04	34	0.000	0	0	34		850	50129	486	197	460	186
1931	58	1028	0.015	16	0.04	38	0.000	0	0	38		975	56521	567	225	538	213
1932	57	585	0.015	9	0.04	21	0.000	0	0	21		555	31630	329	128	312	121
1933	56	737	0.015	11	0.04	27	0.000	0	0	26		699	39172	422	161	401	153
1934	55	1383	0.015	20	0.04	49	0.000	0	0	49		1314	72287	806	302	766	287
1935	54	630	0.014	9	0.04	22	0.000	0	0	22		599	32353	374	138	355	131
1936	53	663	0.014	9	0.03	23	0.000	0	0	23		631	33426	400	145	381	137
1937	52	721	0.014	10	0.03	25	0.000	0	0	24		687	35718	443	157	422	150
1938	51	735	0.014	10	0.03	25	0.000	0	0	24		700	35708	459	160	437	152
1939	50	1137	0.014	16	0.03	37	0.000	0	0	37		1084	54187	721	247	688	236
1940	49	516	0.014	7	0.03	17	0.000	0	0	17		492	24125	333	112	316	107
1941	48	724	0.013	10	0.03	23	0.000	0	0	23		691	33185	475	157	453	150
1942	47	1862	0.013	24	0.03	59	0.000	0	1	58		1779	83630	1240	404	1185	386
1943	46	1247	0.013	16	0.03	39	0.000	0	0	38		1192	54854	843	270	806	258
1944	45	2264	0.013	29	0.03	69	0.000	0	1	68		2166	97482	1554	490	1487	469
1945	44	1531	0.013	19	0.03	46	0.000	0	1	45		1466	64489	1067	331	1021	317
1946	43	4647	0.012	58	0.03	137	0.000	1	2	135		4453	191497	3287	1004	3150	962
1947	42	6150	0.012	75	0.03	176	0.000	1	3	176		5898	247696	4413	1327	4232	1273
1948	41	5755	0.012	70	0.03	164	0.000	1	3	161		5523	226447	4190	1241	4021	1191
1949	40	6027	0.012	72	0.03	168	0.000	2	3	165		5789	231541	4450	1299	4274	1247
1950	39	5802	0.012	68	0.03	159	0.000	2	3	156		5576	217459	4344	1249	4175	1200
1951	38	1781	0.012	21	0.03	48	0.000	1	1	47		1713	65102	1352	383	1301	368
1952	37	1884	0.011	21	0.03	50	0.000	1	1	49		1814	67101	1450	405	1395	390
1953	36	2966	0.011	33	0.03	77	0.000	1	2	75		2859	102907	2314	637	2229	614
1954	35	7987	0.011	88	0.03	203	0.000	3	6	197		7700	269484	6312	1713	6084	1651
1955	34	8652	0.011	94	0.03	216	0.000	4	8	208		8347	283785	6927	1854	6682	1788
1956	33	11545	0.011	123	0.02	282	0.000	6	11	271		11146	367820	9362	2472	9039	2386
1957	32	15327	0.010	160	0.02	367	0.001	8	17	350		14809	473883	12588	3276	12163	3167
1958	31	12032	0.010	124	0.02	282	0.001	7	15	267		11634	380640	10006	2571	9675	2486
1959	30	17209	0.010	174	0.02	394	0.001	12	24	371		16853	499583	14491	3674	14022	3555
1960	29	23835	0.010	237	0.02	534	0.001	16	36	498		23082	669389	20317	5084	19675	4923
1961	28	24333	0.010	237	0.02	533	0.001	21	42	491		23563	660328	20993	5185	20347	5025
1962	27	10410	0.010	100	0.02	223	0.001	10	20	203		10097	272626	9089	2216	8816	2150
1963	26	14307	0.009	134	0.02	299	0.001	15	31	268		13889	361112	12640	3043	12271	2954
1964	25	12439	0.009	115	0.02	254	0.001	15	30	224		12086	302142	11118	2643	10803	2568
1965	24	17081	0.009	154	0.02	340	0.001	23	46	293		16610	398645	15445	3627	15019	3527
1966	23	17043	0.009	151	0.02	330	0.002	26	52	279		16587	381512	15567	3615	15171	3518
1967	22	18350	0.009	159	0.02	346	0.002	31	62	264		17675	393258	16972	3889	16534	3788
1968	21	26512	0.008	225	0.02	487	0.002	50	101	386		25850	542850	24796	5613	24178	5473
1969	20	22468	0.008	187	0.02	401	0.002	48	95	306		21927	438550	21247	4753	20736	4638
1970	19	19881	0.008	162	0.02	345	0.002	47	93	252		19421	368991	19006	4201	18567	4104
1971	18	23724	0.008	189	0.02	400	0.003	61	123	277		23197	417554	22927	5009	22418	4898
1972	17	27018	0.008	210	0.02	441	0.003	77	153	288		26443	449526	26390	5699	25828	5578
1973	16	38300	0.008	291	0.02	606	0.003	117	235	371		37520	600324	37807	8072	37037	7907
1974	15	39281	0.007	292	0.02	602	0.003	129	257	344		38516	577740	39182	8270	38419	8109
1975	14	60846	0.007	441	0.01	901	0.003	210	419	482		59713	835977	61323	12799	60181	12561
1976	13	24459	0.007	173	0.01	350	0.004	87	174	176		24023	312298	24905	5140	24461	5049
1977	12	9280	0.007	64	0.01	128	0.004	33	66	62		9120	109445	9545	1948	9381	1915
1978	11	24636	0.007	167	0.01	327	0.003	86	172	156		24229	266524	25597	5166	25173	5082
1979	10	20151	0.007	134	0.01	257	0.003	66	133	125		19826	198260	21144	4223	20804	4155
1980	9	26729	0.007	174	0.01	328	0.003	80	160	168		26307	236765	28324	5596	27877	5508
1981	8	12188	0.006	79	0.01	143	0.003	32	63	80		11998	95985	13042	2550	12838	2510
1982	7	8954	0.006	58	0.01	101	0.002	19	38	63		8815	61702	9622	1871	9473	1842
1983	6	7560	0.007	49	0.01	81	0.002	12	25	56		7442	44655	8125	1578	7998	1554
1984	5	9990	0.007	67	0.01	102	0.001	12	23	79		9833	49164	10736	2084	10567	2051
1985	4	9925	0.007	71	0.01	96	0.001	7	15	82		9764	39057	10665	2068	10493	2035
1986	3	14930	0.008	120	0.01	137	0.000	6	12	125		14679	44036	16044	3108	15774	3056
1987	2	22143	0.009	210	0.01	192	0.000	3	7	185		21744	43489	23795	4606	23367	4523
1988	1	33790	0.012	400	0.01	275	0.000	1	2	273		33116	33116	36312	7022	35588	6882
1989	0	0	0.016	0	0.01	0	0.000	0	0	0	11636	11636	0	0	0	12504	2416
1990	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1991	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1992	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1993	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1994	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1995	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1996	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1997	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
TOTAL		748865		6526		13004		1393	2785	10219	11636	742363	1.4E+07	710322	158270	706290	158839
													Mean Age	18.68			

SECOND LICENSING SCHEME IMPACT MODEL

SHEET 3

								Re-Eng rq	1393									
YEAR	1990		M.Loss.Rt	0.0085	M.ExitRt	0.05144	M.Eng.Rt	0.06757										
FACTOR	0.50						'a'	15										
							'n'	2.941	Re-Eng	New Build	New Build	Revised		1988	1988	1990	1990
		Init Fleet	Constr. Total Loss		Voluntary Exits		Re-Eng Required		Absorbed	Available	Actual	Total	Age	TOTAL	TOTAL	TOTAL	TOTAL
Year Built	Age	No. VCU	Rate	VCU	Rate	VCU	Rate	VCU	VCU	VCU	VCU	VCU	Calc	POWER	TONNAGE	POWER	TONNAGE
1900	90	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1901	89	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1902	88	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1903	87	191	0.020	4	0.05	10	0.000	0	0	10		177	15407	54	46	46	40
1904	86	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1905	85	176	0.020	4	0.05	9	0.000	0	0	9		164	13912	53	42	46	37
1906	84	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1907	83	420	0.020	8	0.05	21	0.000	0	0	21		391	32417	136	101	118	87
1908	82	99	0.019	2	0.05	5	0.000	0	0	5		93	7599	33	24	29	21
1909	81	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1910	80	48	0.019	1	0.05	2	0.000	0	0	2		45	3563	17	11	15	10
1911	79	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1912	78	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1913	77	666	0.019	12	0.05	31	0.000	0	0	31		623	47980	260	158	228	139
1914	76	141	0.018	3	0.05	6	0.000	0	0	6		132	10006	56	33	49	29
1915	75	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1916	74	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1917	73	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1918	72	0	0.018	0	0.04	0	0.000	0	0	0		0	0	0	0	0	0
1919	71	0	0.017	0	0.04	0	0.000	0	0	0		0	0	0	0	0	0
1920	70	199	0.017	3	0.04	9	0.000	0	0	9		187	13064	92	47	82	41
1921	69	0	0.017	0	0.04	0	0.000	0	0	0		0	0	0	0	0	0
1922	68	203	0.017	3	0.04	9	0.000	0	0	9		191	12996	99	48	88	42
1923	67	35	0.017	1	0.04	1	0.000	0	0	1		33	2193	17	8	15	7
1924	66	162	0.017	3	0.04	7	0.000	0	0	7		153	10098	82	38	73	34
1925	65	130	0.016	2	0.04	5	0.000	0	0	5		123	7998	68	30	60	27
1926	64	93	0.016	2	0.04	4	0.000	0	0	4		88	5618	49	22	44	19
1927	63	235	0.016	4	0.04	9	0.000	0	0	9		222	13992	127	55	113	49
1928	62	77	0.016	1	0.04	3	0.000	0	0	3		72	4487	42	18	38	16
1929	61	766	0.016	12	0.04	29	0.000	0	0	29		725	44219	430	178	385	159
1930	60	850	0.015	13	0.04	32	0.000	0	0	32		804	48256	486	197	435	176
1931	59	975	0.015	15	0.04	37	0.000	0	0	36		923	54464	567	225	509	202
1932	58	555	0.015	8	0.04	21	0.000	0	0	20		526	30510	329	128	296	115
1933	57	699	0.015	10	0.04	26	0.000	0	0	25		664	37823	422	161	380	145
1934	56	1314	0.015	19	0.04	47	0.000	0	0	47		1248	69872	806	302	727	272
1935	55	599	0.015	9	0.04	21	0.000	0	0	21		569	31305	374	138	338	124
1936	54	631	0.014	9	0.04	22	0.000	0	0	22		600	32378	400	145	362	131
1937	53	687	0.014	10	0.03	24	0.000	0	0	24		653	34635	443	157	401	142
1938	52	700	0.014	10	0.03	24	0.000	0	0	24		667	34663	459	160	416	145
1939	51	1084	0.014	15	0.03	36	0.000	0	0	36		1033	52659	721	247	655	224
1940	50	492	0.014	7	0.03	16	0.000	0	0	16		469	23472	333	112	303	102
1941	49	691	0.014	9	0.03	22	0.000	0	0	22		660	32322	475	157	432	143
1942	48	1779	0.013	24	0.03	57	0.000	0	0	56		1699	81551	1240	404	1131	368
1943	47	1192	0.013	16	0.03	38	0.000	0	0	37		1139	53553	843	270	770	247
1944	46	2166	0.013	28	0.03	67	0.000	0	1	66		2071	95284	1554	490	1422	448
1945	45	1466	0.013	19	0.03	45	0.000	0	0	44		1402	63112	1067	331	977	303
1946	44	4453	0.013	56	0.03	133	0.000	1	2	132		4265	187642	3287	1004	3016	921
1947	43	5898	0.012	73	0.03	174	0.000	1	2	171		5652	243018	4413	1327	4056	1220
1948	42	5523	0.012	68	0.03	160	0.000	1	2	158		5297	222459	4190	1241	3856	1142
1949	41	5789	0.012	70	0.03	165	0.000	1	3	162		5555	227765	4450	1299	4102	1197
1950	40	5576	0.012	66	0.03	156	0.000	1	3	153		5355	214204	4344	1249	4010	1153
1951	39	1713	0.012	20	0.03	47	0.000	0	1	46		1647	64217	1352	383	1250	354
1952	38	1814	0.012	21	0.03	49	0.000	1	1	48		1744	66284	1450	405	1342	375
1953	37	2859	0.011	32	0.03	76	0.000	1	2	74		2751	101804	2314	637	2146	591
1954	36	7700	0.011	86	0.03	200	0.000	3	6	194		7417	267000	6312	1713	5861	1591
1955	35	8347	0.011	92	0.03	212	0.000	4	7	205		8046	281609	6927	1854	6441	1724
1956	34	11146	0.011	121	0.03	278	0.000	5	10	267		10753	365592	9362	2472	8720	2302
1957	33	14809	0.011	158	0.02	362	0.001	8	15	346		14297	471805	12586	3276	11742	3058
1958	32	11634	0.010	122	0.02	278	0.001	7	13	265		11240	359685	10006	2571	9348	2402
1959	31	16653	0.010	171	0.02	390	0.001	11	21	369		16102	499166	14491	3674	13558	3438
1960	30	23082	0.010	233	0.02	529	0.001	16	33	496		22337	670100	20317	5084	19040	4764
1961	29	23583	0.010	234	0.02	528	0.001	19	38	491		22839	662341	20993	5185	19705	4867
1962	28	10097	0.010	98	0.02	221	0.001	9	18	203		9787	274026	9089	2216	8545	2084
1963	27	13889	0.010	133	0.02	297	0.001	14	28	269		13473	363763	12640	3043	11903	2866
1964	26	12086	0.009	113	0.02	252	0.001	14	27	225		11733	305064	11118	2643	10488	2493
1965	25	16610	0.009	153	0.02	339	0.001	21	42	297		16139	403486	15445	3627	14593	3427
1966	24	16587	0.009	150	0.02	330	0.001	23	47	283		16131	387150	15567	3615	14753	3422
1967	23	17875	0.009	158	0.02	346	0.002	28	56	290		17399	400178	16972	3889	16093	3687
1968	22	25850	0.009	224	0.02	488	0.002	46	91	396		25184	554043	24796	5613	23554	5332
1969	21	21927	0.008	186	0.02	403	0.002	43	87	316		21382	449022	21247	4753	20220	4523
1970	20	19421	0.008	161	0.02	347	0.002	43	86	261		18955	379104	19006	4201	18122	4006
1971	19	23197	0.008	189	0.02	402	0.002	57	113	289		22663	430597	22927	5009	21901	4785
1972	18	26443	0.008	210	0.02	445	0.003	71	143	303		25858	465450	26390	5699	25257	5455
1973	17	37520	0.008	292	0.02	613	0.003	111	222	391		36726	624347	37807	8072	36253	7740
1974	16	38516	0.008	293	0.02	610	0.003	123	246	363		37737	603788	39182	8270	37642	7945
1975	15	59713	0.007	444	0.02	915	0.003	204	408	507		58558	878376	61323	12799	59018	12318
1976	14	24023	0.007	174	0.01	356	0.004	86	172	183		23579	330108	24905	5140	24009	4955
1977	13	9120	0.007	65	0.01	130	0.004	34	67	63		8959	116468	9545	1948	9215	1881
1978	12	24229	0.007	168	0.01	334	0.004	90	180	154		23818	285812	25597	5168	24745	4996
1979	11	19826	0.007	134	0.01	263	0.004	72	144	119		19500	214505	21144	4223	20462	4087
1980	10	26307	0.007	174	0.01	336	0.003	90	180	156		25887	258868	28324	5596	27432	5420
1981	9	11998	0.007	78	0.01	147	0.003	37	75	72		11810	106291	13042	2550	12637	2470
1982	8	8815	0.006	57	0.01	104	0.003	24	48	56		8678	69424	9822	1871	9326	1814
1983	7	7442	0.006	48	0.01	84	0.002	16	33	51		7327	51292	8125	1578	7874	1530
1984	6	9833	0.007	64	0.01	106	0.002	17	34	72		9680	58080	10736	2084	10403	2019
1985	5	9764	0.007	66	0.01	100	0.001	12	24	76		9610	46052	10665	2068	10328	2003
1986	4	14679	0.007	106	0.01	142	0.001	11	23	120		14442	57767	16044	3108	15520	3007
1987	3	21744	0.008	175	0.01	200	0.000	9	18	182		21379	64136	23795	4606	22975	4447
1988	2	33116	0.009	314	0.01	287	0.000	5	10	276		32520	65041	36312	7022	34948	6758
1989	1	11636	0.012	138	0.01	95	0.000	0	1	94		11404	11404	0	0	12255	2367
1990	0	0	0.016	0	0.01	0	0.000	0	0	0	11642	11642	0	0	0	12511	2415
1991	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1992	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1993	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1994	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1995	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1996	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1997	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
TOTAL		742363		6474		13121		1393	2785	10336	11642	735802	1.4E+07	710322	158270	702162	155394
													Mean Age	19.27			

SECOND LICENSING SCHEME IMPACT MODEL — SHEET 4

YEAR 1991 M.Loss.Rt 0.0085 M.ExitRt 0.05144 Re-Eng rq M.Eng.Rt 1393 0.07058
FACTOR 0.50 'a' 15
'n' 2.941

Year Built	Age	Init Fleet No. VCU	Constr. Total Loss Rate	Constr. Total Loss VCU	Voluntary Exits Rate	Voluntary Exits VCU	Re-Eng Required Rate	Re-Eng Required VCU	Re-Eng Absorbed VCU	New Build Available VCU	New Build Actual VCU	Revised Total VCU	Age Calc	1988 TOTAL POWER	1988 TOTAL TONNAGE	1991 TOTAL POWER	1991 TOTAL TONNAGE
1900	91	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1901	90	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1902	89	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1903	88	177	0.021	4	0.05	9	0.000	0	0	9		165	14479	54	46	43	37
1904	87	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1905	86	164	0.020	3	0.05	8	0.000	0	0	8		152	13083	53	42	43	34
1906	85	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1907	84	391	0.020	8	0.05	19	0.000	0	0	19		363	30521	136	101	110	81
1908	83	93	0.020	2	0.05	5	0.000	0	0	5		86	7161	33	24	27	19
1909	82	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1910	81	45	0.019	1	0.05	2	0.000	0	0	2		42	3364	17	11	14	9
1911	80	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1912	79	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1913	78	623	0.019	12	0.05	29	0.000	0	0	29		582	45412	260	156	213	130
1914	77	132	0.019	2	0.05	6	0.000	0	0	6		123	9479	56	33	46	27
1915	76	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1916	75	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1917	74	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1918	73	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1919	72	0	0.018	0	0.04	0	0.000	0	0	0		0	0	0	0	0	0
1920	71	187	0.017	3	0.04	8	0.000	0	0	8		175	12444	92	47	77	39
1921	70	0	0.017	0	0.04	0	0.000	0	0	0		0	0	0	0	0	0
1922	69	191	0.017	3	0.04	8	0.000	0	0	8		180	12402	99	48	82	40
1923	68	33	0.017	1	0.04	1	0.000	0	0	1		31	2094	17	8	14	7
1924	67	153	0.017	3	0.04	6	0.000	0	0	6		144	9654	82	38	69	32
1925	66	123	0.017	2	0.04	5	0.000	0	0	5		116	7654	68	30	57	26
1926	65	88	0.016	1	0.04	4	0.000	0	0	4		83	5381	49	22	41	18
1927	64	222	0.016	4	0.04	9	0.000	0	0	9		210	13416	127	55	107	46
1928	63	72	0.016	1	0.04	3	0.000	0	0	3		68	4307	42	18	36	15
1929	62	725	0.016	11	0.04	28	0.000	0	0	28		685	42482	430	178	364	150
1930	61	804	0.016	13	0.04	31	0.000	0	0	31		761	46406	486	197	412	167
1931	60	923	0.015	14	0.04	35	0.000	0	0	35		874	52429	567	225	482	191
1932	59	526	0.015	8	0.04	20	0.000	0	0	20		498	29400	329	128	280	109
1933	58	664	0.015	10	0.04	25	0.000	0	0	24		629	36484	422	161	360	137
1934	57	1248	0.015	19	0.04	46	0.000	0	0	45		1184	67467	806	302	690	256
1935	56	569	0.015	8	0.04	20	0.000	0	0	20		540	30259	374	138	321	118
1936	55	600	0.015	9	0.04	21	0.000	0	0	21		570	31329	400	145	344	124
1937	54	653	0.014	9	0.04	23	0.000	0	0	23		621	33549	443	157	381	135
1938	53	667	0.014	9	0.03	23	0.000	0	0	23		634	33612	459	160	396	138
1939	52	1033	0.014	15	0.03	35	0.000	0	0	35		983	51118	721	247	624	214
1940	51	469	0.014	7	0.03	16	0.000	0	0	16		447	22810	333	112	289	97
1941	50	660	0.014	9	0.03	22	0.000	0	0	22		629	31446	475	157	412	136
1942	49	1699	0.014	23	0.03	55	0.000	0	0	55		1621	79432	1240	404	1079	351
1943	48	1139	0.013	15	0.03	36	0.000	0	0	36		1088	52222	843	270	736	236
1944	47	2071	0.013	27	0.03	65	0.000	0	1	65		1979	93025	1554	490	1359	428
1945	46	1402	0.013	18	0.03	43	0.000	0	0	43		1341	61690	1067	331	935	290
1946	45	4265	0.013	55	0.03	130	0.000	1	2	128		4081	183637	3267	1004	2886	882
1947	44	5652	0.013	71	0.03	169	0.000	1	2	167		5412	236128	4413	1327	3884	1168
1948	43	5297	0.012	66	0.03	156	0.000	1	2	154		5076	218259	4190	1241	3695	1095
1949	42	5555	0.012	68	0.03	161	0.000	1	3	158		5328	223756	4450	1299	3934	1148
1950	41	5355	0.012	65	0.03	152	0.000	1	3	150		5139	210714	4344	1249	3848	1106
1951	40	1647	0.012	20	0.03	46	0.000	0	1	45		1581	63256	1352	383	1200	340
1952	39	1744	0.012	20	0.03	48	0.000	1	1	47		1676	65383	1450	405	1290	360
1953	38	2751	0.012	32	0.03	74	0.000	1	2	72		2646	100565	2314	637	2064	568
1954	37	7417	0.011	84	0.03	196	0.000	3	5	191		7139	264141	6312	1713	5641	1531
1955	36	8046	0.011	90	0.03	209	0.000	3	6	202		7750	279017	6927	1854	6205	1661
1956	35	10753	0.011	118	0.03	274	0.000	5	9	264		10366	362797	9362	2472	8406	2219
1957	34	14297	0.011	155	0.03	356	0.000	7	14	343		13793	468957	12588	3278	11328	2950
1958	33	11240	0.011	120	0.02	275	0.001	6	12	262		10852	358116	10006	2571	9025	2319
1959	32	16102	0.010	169	0.02	385	0.001	10	19	366		15558	497858	14491	3074	13100	3321
1960	31	22337	0.010	230	0.02	523	0.001	15	30	493		21599	669561	20317	5084	18411	4607
1961	30	22839	0.010	231	0.02	523	0.001	17	34	489		22102	663066	20993	5185	19069	4710
1962	29	9787	0.010	97	0.02	219	0.001	8	16	203		9478	274872	9089	2216	8276	2018
1963	28	13473	0.010	131	0.02	295	0.001	13	25	270		13059	365647	12640	3043	11537	2778
1964	27	11733	0.010	112	0.02	251	0.001	12	24	227		11382	307318	11116	2643	10174	2419
1965	26	16139	0.009	152	0.02	337	0.001	19	38	299		15670	407409	15445	3627	14169	3327
1966	25	16131	0.009	149	0.02	329	0.001	21	42	287		15675	391874	15587	3615	14336	3325
1967	24	17399	0.009	157	0.02	346	0.001	26	51	295		16922	406118	16972	3889	15651	3586
1968	23	25184	0.009	223	0.02	488	0.002	42	83	405		24514	563833	24798	5613	22928	5190
1969	22	21382	0.009	185	0.02	403	0.002	39	79	324		20833	458318	21247	4753	19701	4407
1970	21	16955	0.008	161	0.02	348	0.002	39	78	270		18465	388191	19006	4201	17673	3907
1971	20	22663	0.008	188	0.02	405	0.002	52	104	300		22122	442443	22927	5009	21379	4671
1972	19	25858	0.008	210	0.02	449	0.003	66	132	316		25265	480044	26390	5699	24678	5330
1973	18	36726	0.008	292	0.02	618	0.003	103	207	411		35919	646544	37807	8072	35457	7570
1974	17	37737	0.008	294	0.02	616	0.003	116	233	384		36943	628034	39182	8270	36850	7778
1975	16	58558	0.008	445	0.02	927	0.003	196	391	536		57362	918112	61323	12799	57833	12070
1976	15	23579	0.007	175	0.02	361	0.004	84	168	193		23127	346904	24905	5140	23548	4860
1977	14	8959	0.007	65	0.01	133	0.004	34	67	65		8795	123130	9545	1948	9046	1847
1978	13	23818	0.007	169	0.01	341	0.004	92	184	157		23400	304203	25597	5168	24312	4909
1979	12	19500	0.007	135	0.01	269	0.004	76	151	118		19172	230066	21144	4223	20118	4018
1980	11	25867	0.007	175	0.01	344	0.004	98	196	148		25466	280125	28324	5596	26985	5332
1981	10	11810	0.007	78	0.01	151	0.004	42	85	66		11623	116232	13042	2550	12437	2431
1982	9	8678	0.007	57	0.01	106	0.003	28	56	50		8543	76889	9622	1871	9181	1785
1983	8	7327	0.006	47	0.01	86	0.003	21	41	45		7215	57718	8125	1578	7753	1506
1984	7	9680	0.006	62	0.01	109	0.002	22	45	64		9531	66720	10736	2084	10243	1988
1985	6	9610	0.007	63	0.01	103	0.002	17	34	69		9462	56772	10665	2068	10168	1972
1986	5	14442	0.007	97	0.01	148	0.001	18	37	111		14215	71077	16044	3108	15276	2960
1987	4	21379	0.007	154	0.01	207	0.001	17	34	173		21035	84138	23795	4606	22605	4375
1988	3	32520	0.008	261	0.01	299	0.000	14	28	271		31974	95922	36312	7022	34361	6644
1989	2	11404	0.009	108	0.01	99	0.000	2	4	95		11199	22398	0	0	12035	2325
1990	1	11642	0.012	138	0.01	95	0.000	0	1	94		11410	11410	0	0	12261	2366
1991	0	0	0.016	0	0.01	0	0.000	0	0	0	11669	11669	0	0	0	12540	2418
1992	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1993	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1994	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1995	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1996	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1997	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
TOTAL		735802		6448		13227		1393	2785	10442	11669	729189	1.4E+07	710322	158270	697940	153937
													Mean Age	19.85			

SECOND LICENSING SCHEME IMPACT MODEL

SHEET 5

							Re-Eng rq	1393									
YEAR	1992		M.Loss.Rt	0.0085	M.ExitRt	0.05144	M.Eng.Rt	0.07378									
FACTOR	0.50						'a'	15									
							'n'	2.941	Re-Eng	New Build	New Build	Revised		1988	1988	1992	1992
		Init Fleet	Constr. Total Loss		Voluntary Exits		Re-Eng	Required	Absorbed	Available	Actual	Total	Age	TOTAL	TOTAL	TOTAL	TOTAL
Year Built	Age	No. VCU	Rate	VCU	Rate	VCU	Rate	VCU	VCU	VCU	VCU	VCU	Calc	POWER	TONNAGE	POWER	TONNAGE
1900	92	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1901	91	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1902	90	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1903	89	165	0.021	3	0.05	8	0.000	0	0	8		153	13603	54	46	40	34
1904	88	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1905	87	152	0.020	3	0.05	8	0.000	0	0	8		141	12299	53	42	40	32
1906	86	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1907	85	363	0.020	7	0.05	18	0.000	0	0	18		338	28711	136	101	102	76
1908	84	86	0.020	2	0.05	4	0.000	0	0	4		80	6742	33	24	25	18
1909	83	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1910	82	42	0.019	1	0.05	2	0.000	0	0	2		39	3172	17	11	13	9
1911	81	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1912	80	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1913	79	582	0.019	11	0.05	28	0.000	0	0	28		544	42945	260	158	199	121
1914	78	123	0.019	2	0.05	6	0.000	0	0	6		115	8972	56	33	43	26
1915	77	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1916	76	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1917	75	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1918	74	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1919	73	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1920	72	175	0.018	3	0.04	8	0.000	0	0	8		164	11842	92	47	72	36
1921	71	0	0.017	0	0.04	0	0.000	0	0	0		0	0	0	0	0	0
1922	70	180	0.017	3	0.04	8	0.000	0	0	8		169	11824	99	48	77	37
1923	69	31	0.017	1	0.04	1	0.000	0	0	1		29	1999	17	8	14	6
1924	68	144	0.017	2	0.04	6	0.000	0	0	6		136	9222	82	38	65	30
1925	67	116	0.017	2	0.04	5	0.000	0	0	5		109	7318	68	30	53	24
1926	66	83	0.017	1	0.04	3	0.000	0	0	3		78	5150	49	22	39	17
1927	65	210	0.016	3	0.04	8	0.000	0	0	8		198	12851	127	55	101	43
1928	64	88	0.016	1	0.04	3	0.000	0	0	3		85	4130	42	18	34	14
1929	63	685	0.016	11	0.04	27	0.000	0	0	27		647	40773	430	178	344	142
1930	62	761	0.016	12	0.04	30	0.000	0	0	30		719	44583	486	197	389	158
1931	61	874	0.016	14	0.04	34	0.000	0	0	34		827	50419	567	225	456	181
1932	60	498	0.015	8	0.04	19	0.000	0	0	19		472	28301	329	128	265	103
1933	59	629	0.015	10	0.04	24	0.000	0	0	23		596	35156	422	161	341	130
1934	58	1184	0.015	18	0.04	44	0.000	0	0	44		1122	65078	806	302	654	245
1935	57	540	0.015	8	0.04	20	0.000	0	0	20		513	29218	374	138	304	112
1936	56	570	0.015	8	0.04	20	0.000	0	0	20		541	30282	400	145	326	118
1937	55	621	0.015	9	0.04	22	0.000	0	0	22		590	32462	443	157	362	129
1938	54	634	0.014	9	0.04	22	0.000	0	0	22		603	32558	459	160	376	131
1939	53	983	0.014	14	0.03	34	0.000	0	0	34		935	49568	721	247	594	203
1940	52	447	0.014	6	0.03	15	0.000	0	0	15		426	22143	333	112	275	92
1941	51	629	0.014	9	0.03	21	0.000	0	0	21		599	30560	475	157	393	130
1942	50	1621	0.014	22	0.03	53	0.000	0	0	53		1546	77280	1240	404	1029	335
1943	49	1088	0.014	15	0.03	35	0.000	0	0	35		1038	50865	843	270	702	225
1944	48	1979	0.013	26	0.03	63	0.000	0	1	63		1890	90713	1554	490	1298	409
1945	47	1341	0.013	18	0.03	42	0.000	0	0	42		1281	60228	1067	331	893	277
1946	46	4081	0.013	53	0.03	126	0.000	1	1	125		3902	179500	3287	1004	2760	843
1947	45	5412	0.013	69	0.03	165	0.000	1	2	163		5179	233048	4413	1327	3717	1118
1948	44	5076	0.013	64	0.03	152	0.000	1	2	150		4861	213869	4190	1241	3539	1048
1949	43	5328	0.012	66	0.03	157	0.000	1	2	155		5105	219535	4450	1299	3770	1100
1950	42	5139	0.012	63	0.03	149	0.000	1	2	146		4929	207007	4344	1249	3690	1061
1951	41	1581	0.012	19	0.03	45	0.000	0	1	44		1518	62226	1352	383	1152	326
1952	40	1676	0.012	20	0.03	47	0.000	0	1	46		1610	64406	1450	405	1239	346
1953	39	2646	0.012	31	0.03	73	0.000	1	2	71		2544	99201	2314	637	1984	546
1954	38	7139	0.012	82	0.03	192	0.000	2	5	187		6867	260931	6312	1713	5426	1473
1955	37	7750	0.011	88	0.03	205	0.000	3	6	199		7460	276034	6927	1854	5973	1599
1956	36	10366	0.011	116	0.03	269	0.000	4	9	260		9985	359465	9362	2472	8097	2138
1957	35	13793	0.011	152	0.03	351	0.000	6	13	338		13297	465381	12588	3278	10920	2844
1958	34	10852	0.011	117	0.03	271	0.001	6	11	260		10470	355963	10006	2571	8707	2237
1959	33	15558	0.011	166	0.02	380	0.001	9	18	362		15021	495700	14491	3674	12648	3207
1960	32	21599	0.010	226	0.02	517	0.001	14	27	490		20870	667625	20317	5084	17789	4451
1961	31	22102	0.010	227	0.02	518	0.001	15	31	487		21373	662554	20993	5185	18439	4554
1962	30	9478	0.010	96	0.02	217	0.001	7	15	202		9173	275182	9089	2216	8009	1953
1963	29	13059	0.010	130	0.02	293	0.001	11	23	270		12648	366789	12640	3043	11174	2690
1964	28	11382	0.010	111	0.02	249	0.001	11	22	227		11033	308923	11118	2643	9862	2345
1965	27	15670	0.010	150	0.02	335	0.001	17	34	301		15201	410438	15445	3627	13745	3227
1966	26	15675	0.009	147	0.02	327	0.001	19	38	289		15219	395706	15587	3615	13919	3228
1967	25	16922	0.009	156	0.02	345	0.001	23	46	299		16444	411099	16972	3889	15210	3485
1968	24	24514	0.009	221	0.02	487	0.002	38	75	412		23843	572242	24796	5613	22301	5048
1969	23	20833	0.009	184	0.02	404	0.002	36	72	332		20281	466452	21247	4753	19179	4290
1970	22	18485	0.009	160	0.02	349	0.002	36	71	277		18012	396262	19006	4201	17220	3806
1971	21	22122	0.008	188	0.02	406	0.002	46	96	311		21576	453092	22927	5009	20851	4555
1972	20	25265	0.008	210	0.02	451	0.002	61	122	330		24665	493302	26390	5699	24092	5203
1973	19	35919	0.008	292	0.02	623	0.003	96	192	431		35100	666894	37807	8072	34648	7397
1974	18	36943	0.008	294	0.02	622	0.003	109	218	404		36136	650447	39182	8270	36045	7608
1975	17	57382	0.008	446	0.02	937	0.003	185	370	567		56183	955118	61323	12799	56624	11818
1976	16	23127	0.008	176	0.02	366	0.003	81	161	205		22666	362654	24905	5140	23079	4763
1977	15	8795	0.007	65	0.02	135	0.004	33	66	69		8628	129416	9545	1948	8874	1811
1978	14	23400	0.007	170	0.01	347	0.004	92	183	163		22976	321659	25597	5168	23870	4819
1979	13	19172	0.007	136	0.01	274	0.004	77	155	119		18840	244915	21144	4223	19769	3948
1980	12	25466	0.007	176	0.01	351	0.004	103	207	144		25042	300501	28324	5596	26536	5243
1981	11	11623	0.007	79	0.01	154	0.004	46	92	62		11436	125798	13042	2550	12237	2392
1982	10	8543	0.007	57	0.01	109	0.004	32	64	45		8409	84094	9622	1871	9037	1757
1983	9	7215	0.007	47	0.01	88	0.003	25	49	39		7104	63934	8125	1578	7634	1483
1984	8	9531	0.006	61	0.01	112	0.003	28	56	56		9386	75088	10736	2084	10087	1958
1985	7	9462	0.006	61	0.01	106	0.002	23	46	61		9318	65224	10665	2068	10013	1942
1986	6	14215	0.007	92	0.01	153	0.002	26	53	100		13997	83981	16044	3108	15042	2914
1987	5	21035	0.007	142	0.01	215	0.001	28	56	159		20706	103529	23795	4606	22251	4307
1988	4	31974	0.007	230	0.01	310	0.001	27	54	257		31461	125842	36312	7022	33809	6538
1989	3	11199	0.008	90	0.01	103	0.000	5	10	93		11011	33033	0	0	11833	2286
1990	2	11410	0.009	108	0.01	99	0.000	2	4	95		11205	22409	0	0	12041	2324
1991	1	11669	0.012	138	0.01	95	0.000	0	1	94		11436	11436	0	0	12290	2370
1992	0	0	0.016	0	0.01	0	0.000	0	0	0	11706	11706	0	0	0	12579	2423
1993	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1994	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1995	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1996	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1997	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
TOTAL		729189		6438		13321		1393	2785	10536	11706	722528	1.5E+07	710322	158270	693629	152469
													Mean Age	20.41			

SECOND LICENSING SCHEME IMPACT MODEL

SHEET 6

							Re-Eng rq	1393									
YEAR	1993		M.Loss.Rt	0.0085	M.ExitRt	0.05144	M.Eng.Rt	0.07708									
FACTOR	0.50						's'	15									
							'n'	2.941	Re-Eng	New Build	New Build	Revised		1988	1988	1993	1993
		Init Fleet	Constr. Total Loss		Voluntary Exits		Re-Eng Required		Absorbed	Available	Actual	Total	Age	TOTAL	TOTAL	TOTAL	TOTAL
Year Built	Age	No. VCU	Rate	VCU	Rate	VCU	Rate	VCU	VCU	VCU	VCU	VCU	Calc	POWER	TONNAGE	POWER	TONNAGE
1900	93	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1901	92	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1902	91	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1903	90	153	0.021	3	0.05	8	0.000	0	0	8		142	12776	54	46	37	32
1904	89	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1905	88	141	0.021	3	0.05	7	0.000	0	0	7		131	11559	53	42	37	29
1906	87	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1907	86	338	0.020	7	0.05	17	0.000	0	0	17		314	27000	136	101	95	70
1908	85	80	0.020	2	0.05	4	0.000	0	0	4		75	6342	33	24	23	17
1909	84	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1910	83	39	0.020	1	0.05	2	0.000	0	0	2		36	2990	17	11	12	8
1911	82	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1912	81	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1913	80	544	0.019	10	0.05	26	0.000	0	0	26		507	40575	260	158	185	113
1914	79	115	0.019	2	0.05	5	0.000	0	0	5		107	8484	56	33	40	24
1915	78	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1916	77	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1917	76	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1918	75	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1919	74	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1920	73	164	0.018	3	0.05	7	0.000	0	0	7		154	11259	92	47	68	34
1921	72	0	0.018	0	0.04	0	0.000	0	0	0		0	0	0	0	0	0
1922	71	169	0.017	3	0.04	7	0.000	0	0	7		159	11262	99	48	73	35
1923	70	29	0.017	1	0.04	1	0.000	0	0	1		27	1906	17	8	13	6
1924	69	136	0.017	2	0.04	6	0.000	0	0	6		128	8800	82	38	61	28
1925	68	109	0.017	2	0.04	5	0.000	0	0	5		103	6990	68	30	50	23
1926	67	78	0.017	1	0.04	3	0.000	0	0	3		73	4924	49	22	37	16
1927	66	198	0.017	3	0.04	8	0.000	0	0	8		186	12298	127	55	95	41
1928	65	65	0.016	1	0.04	3	0.000	0	0	3		61	3956	42	18	32	13
1929	64	647	0.016	10	0.04	26	0.000	0	0	26		611	39095	430	178	324	134
1930	63	719	0.016	12	0.04	28	0.000	0	0	28		679	42790	486	197	368	149
1931	62	827	0.016	13	0.04	32	0.000	0	0	32		781	48439	567	225	431	171
1932	61	472	0.016	7	0.04	18	0.000	0	0	18		446	27217	329	128	251	98
1933	60	596	0.015	9	0.04	23	0.000	0	0	23		564	33843	422	161	323	123
1934	59	1122	0.015	17	0.04	42	0.000	0	0	42		1063	62709	806	302	620	232
1935	58	513	0.015	8	0.04	19	0.000	0	0	19		486	28183	374	138	288	106
1936	57	541	0.015	8	0.04	20	0.000	0	0	20		513	29240	400	145	310	112
1937	56	590	0.015	9	0.04	21	0.000	0	0	21		560	31377	443	157	344	122
1938	55	603	0.015	9	0.04	21	0.000	0	0	21		573	31503	459	160	358	125
1939	54	935	0.014	13	0.04	33	0.000	0	0	33		889	48014	721	247	564	193
1940	53	426	0.014	6	0.03	15	0.000	0	0	15		405	21471	333	112	261	88
1941	52	599	0.014	8	0.03	20	0.000	0	0	20		571	29666	475	157	374	124
1942	51	1546	0.014	21	0.03	52	0.000	0	0	51		1473	75102	1240	404	981	319
1943	50	1038	0.014	14	0.03	34	0.000	0	0	34		990	49488	843	270	669	214
1944	49	1890	0.014	26	0.03	61	0.000	0	1	61		1803	88357	1554	490	1238	390
1945	48	1281	0.013	17	0.03	41	0.000	0	0	41		1224	58732	1067	331	853	265
1946	47	3902	0.013	51	0.03	123	0.000	1	1	122		3729	175247	3287	1004	2637	806
1947	46	5179	0.013	67	0.03	160	0.000	1	2	159		4952	227799	4413	1327	3554	1069
1948	45	4861	0.013	62	0.03	148	0.000	1	2	146		4651	209308	4190	1241	3386	1003
1949	44	5105	0.013	64	0.03	153	0.000	1	2	151		4889	215121	4450	1299	3610	1053
1950	43	4929	0.012	61	0.03	145	0.000	1	2	143		4723	203103	4344	1249	3537	1017
1951	42	1518	0.012	19	0.03	44	0.000	0	1	43		1456	61132	1352	383	1105	313
1952	41	1610	0.012	19	0.03	46	0.000	0	1	45		1545	63358	1450	405	1189	332
1953	40	2544	0.012	30	0.03	71	0.000	1	2	70		2443	97720	2314	637	1905	524
1954	39	6867	0.012	80	0.03	189	0.000	2	4	184		6600	257395	6312	1713	5215	1415
1955	38	7460	0.012	86	0.03	201	0.000	3	5	196		7176	272685	6927	1854	5745	1538
1956	37	9985	0.011	113	0.03	264	0.000	4	8	256		9612	355628	9362	2472	7794	2058
1957	36	13297	0.011	149	0.03	345	0.000	6	12	333		12809	461116	12588	3278	10520	2740
1958	35	10470	0.011	115	0.03	266	0.000	5	10	256		10093	353256	10006	2571	8394	2157
1959	34	15021	0.011	163	0.03	375	0.001	8	16	359		14492	492731	14491	3674	12203	3094
1960	33	20870	0.011	222	0.02	510	0.001	12	25	485		20150	664947	20317	5084	17176	4298
1961	32	21373	0.010	224	0.02	511	0.001	14	28	483		20652	660856	20993	5185	17817	4401
1962	31	9173	0.010	94	0.02	215	0.001	7	13	201		8870	274978	9089	2216	7745	1888
1963	30	12648	0.010	128	0.02	290	0.001	10	21	269		12241	367217	12640	3043	10814	2604
1964	29	11033	0.010	110	0.02	247	0.001	10	20	227		10686	309900	11118	2643	9552	2271
1965	28	15201	0.010	148	0.02	333	0.001	15	31	302		14736	412600	15445	3627	13324	3129
1966	27	15219	0.010	146	0.02	326	0.001	17	35	291		14765	398668	15587	3615	13504	3132
1967	26	16444	0.009	154	0.02	344	0.001	21	42	302		15967	415142	16972	3889	14769	3384
1968	25	23843	0.009	220	0.02	486	0.001	34	68	418		23172	579296	24796	5613	21673	4906
1969	24	20281	0.009	183	0.02	403	0.002	33	65	338		19727	473442	21247	4753	18655	4173
1970	23	18012	0.009	159	0.02	349	0.002	32	65	284		17536	403327	19006	4201	16765	3706
1971	22	21576	0.009	187	0.02	407	0.002	44	87	320		21025	462553	22927	5009	20319	4439
1972	21	24665	0.008	209	0.02	453	0.002	56	111	342		24058	505226	26390	5699	23499	5075
1973	20	35100	0.008	292	0.02	627	0.003	88	176	450		34269	685389	37807	8072	33828	7222
1974	19	36136	0.008	294	0.02	627	0.003	101	202	425		35316	671002	39182	8270	35227	7436
1975	18	56183	0.008	447	0.02	946	0.003	173	346	600		54963	989336	61323	12799	55395	11562
1976	17	22666	0.008	176	0.02	370	0.003	76	153	218		22196	377326	24905	5140	22600	4665
1977	16	8628	0.008	66	0.02	137	0.004	31	63	74		8457	135313	9545	1948	8699	1776
1978	15	22976	0.007	171	0.02	352	0.004	90	179	173		22543	338139	25597	5168	23420	4729
1979	14	18840	0.007	137	0.01	279	0.004	77	154	125		18501	259015	21144	4223	19413	3877
1980	13	25042	0.007	177	0.01	358	0.004	106	211	147		24612	319953	28324	5596	26080	5153
1981	12	11436	0.007	79	0.01	158	0.004	49	97	61		11248	134973	13042	2550	12036	2353
1982	11	8409	0.007	57	0.01	112	0.004	35	70	42		8276	91031	9622	1871	8893	1729
1983	10	7104	0.007	47	0.01	91	0.004	28	56	35		6994	69937	8125	1578	7516	1460
1984	9	9386	0.007	61	0.01	115	0.004	33	67	48		9243	83187	10736	2084	9933	1928
1985	8	9318	0.006	60	0.01	110	0.003	29	57	52		9177	73414	10665	2068	9862	1912
1986	7	13997	0.006	90	0.01	157	0.003	35	71	87		13785	96494	16044	3108	14814	2870
1987	6	20706	0.007	135	0.01	222	0.002	40	81	142		20389	122335	23795	4606	21911	4241
1988	5	31461	0.007	212	0.01	321	0.001	43	87	235		30971	154853	36312	7022	33282	6436
1989	4	11011	0.007	79	0.01	107	0.001	10	19	88		10834	43338	0	0	11643	2249
1990	3	11205	0.008	90	0.01	103	0.000	5	10	92		11017	33051	0	0	11839	2285
1991	2	11436	0.009	108	0.01	99	0.000	2	4	95		11231	22462	0	0	12069	2327
1992	1	11706	0.012	139	0.01	95	0.000	0	1	95		11472	11472	0	0	12328	2375
1993	0	0	0.016	0	0.01	0	0.000	0	0	0	11745	11745	0	0	0	12622	2429
1994	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1995	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1996	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1997	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
TOTAL		722528		6435		13405		1393	2785	10620	11745	715826	1.5E+07	710322	158270	689232	150991
													Mean Age	20.96			

SECOND LICENSING SCHEME IMPACT MODEL

SHEET 7

							Re-Eng rq	1393									
YEAR	1994		M.Loss.Rt	0.0085	M.ExitRt	0.05144	M.Eng.Rt	0.08044									
FACTOR	0.50						'a'	15									
							'n'	2.941	Re-Eng	New Build	New Build	Revised		1988	1988	1994	1994
		Init Fleet	Constr. Total Loss		Voluntary Exits		Re-Eng Required		Absorbed	Available	Actual	Total	Age	TOTAL	TOTAL	TOTAL	TOTAL
Year Built	Age	No. VCU	Rate	VCU	Rate	VCU	Rate	VCU	VCU	VCU	VCU	VCU	Calc	POWER	TONNAGE	POWER	TONNAGE
1900	94	0	0.022	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1901	93	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1902	92	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1903	91	142	0.021	3	0.05	7	0.000	0	0	7		132	11996	54	46	34	30
1904	90	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1905	89	131	0.021	3	0.05	7	0.000	0	0	7		122	10860	53	42	34	27
1906	88	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1907	87	314	0.020	6	0.05	16	0.000	0	0	16		292	25382	136	101	66	65
1908	86	75	0.020	2	0.05	4	0.000	0	0	4		69	5964	33	24	22	15
1909	85	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1910	84	36	0.020	1	0.05	2	0.000	0	0	2		34	2815	17	11	11	7
1911	83	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1912	82	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1913	81	507	0.019	10	0.05	25	0.000	0	0	25		473	38302	260	158	173	105
1914	80	107	0.019	2	0.05	5	0.000	0	0	5		100	8016	56	33	38	22
1915	79	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1916	78	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1917	77	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1918	76	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1919	75	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1920	74	154	0.018	3	0.05	7	0.000	0	0	7		145	10695	92	47	63	32
1921	73	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1922	72	159	0.018	3	0.04	7	0.000	0	0	7		149	10718	99	48	68	33
1923	71	27	0.017	0	0.04	1	0.000	0	0	1		26	1815	17	8	12	6
1924	70	128	0.017	2	0.04	5	0.000	0	0	5		120	8390	82	36	57	26
1925	69	103	0.017	2	0.04	4	0.000	0	0	4		97	6670	66	30	47	21
1926	68	73	0.017	1	0.04	3	0.000	0	0	3		69	4703	49	22	35	15
1927	67	186	0.017	3	0.04	8	0.000	0	0	8		176	11759	127	55	90	39
1928	66	61	0.017	1	0.04	2	0.000	0	0	2		57	3786	42	18	30	13
1929	65	611	0.016	10	0.04	25	0.000	0	0	25		576	37450	430	178	306	126
1930	64	579	0.016	11	0.04	27	0.000	0	0	27		641	41029	486	197	347	141
1931	63	761	0.016	13	0.04	31	0.000	0	0	31		738	46491	567	225	407	162
1932	62	446	0.016	7	0.04	17	0.000	0	0	17		422	26148	329	128	237	92
1933	61	564	0.016	9	0.04	22	0.000	0	0	22		534	32546	422	161	305	117
1934	60	1063	0.015	16	0.04	40	0.000	0	0	40		1006	60367	806	302	566	220
1935	59	486	0.015	7	0.04	18	0.000	0	0	18		460	27158	374	138	273	100
1936	58	513	0.015	8	0.04	19	0.000	0	0	19		486	28205	400	145	294	106
1937	57	560	0.015	8	0.04	20	0.000	0	0	20		532	30298	443	157	326	116
1938	56	573	0.015	8	0.04	21	0.000	0	0	21		544	30451	459	160	340	118
1939	55	889	0.015	13	0.04	32	0.000	0	0	31		845	46459	721	247	536	184
1940	54	405	0.014	6	0.04	14	0.000	0	0	14		385	20798	333	112	248	84
1941	53	571	0.014	8	0.03	20	0.000	0	0	20		543	28767	475	157	356	118
1942	52	1473	0.014	21	0.03	50	0.000	0	0	50		1402	72906	1240	404	934	304
1943	51	990	0.014	14	0.03	33	0.000	0	0	33		943	48093	843	270	638	204
1944	50	1803	0.014	25	0.03	59	0.000	0	0	59		1719	85965	1554	490	1180	372
1945	49	1224	0.014	17	0.03	40	0.000	0	0	39		1167	57207	1087	331	814	252
1946	48	3729	0.013	50	0.03	119	0.000	1	1	118		3560	170895	3287	1004	2518	769
1947	47	4952	0.013	65	0.03	156	0.000	1	2	154		4732	222403	4413	1327	3396	1021
1948	46	4651	0.013	60	0.03	144	0.000	1	2	142		4448	204596	4190	1241	3238	959
1949	45	4689	0.013	63	0.03	149	0.000	1	2	147		4679	210535	4450	1299	3455	1008
1950	44	4723	0.013	60	0.03	142	0.000	1	2	139		4523	199022	4344	1249	3387	974
1951	43	1456	0.012	18	0.03	43	0.000	0	1	42		1395	59980	1352	383	1059	300
1952	42	1545	0.012	19	0.03	45	0.000	0	1	44		1482	62245	1450	405	1140	318
1953	41	2443	0.012	30	0.03	70	0.000	1	1	68		2345	96131	2314	637	1828	503
1954	40	6600	0.012	79	0.03	185	0.000	2	4	180		6339	253555	6312	1713	5009	1359
1955	39	7176	0.012	84	0.03	197	0.000	2	5	192		6897	268993	6927	1854	5522	1478
1956	38	9512	0.012	111	0.03	259	0.000	4	7	252		9245	351316	9362	2472	7497	1979
1957	37	12809	0.011	146	0.03	339	0.000	5	11	328		12330	456202	12588	3276	10126	2637
1958	36	10093	0.011	113	0.03	262	0.000	5	9	253		9723	350025	10006	2571	8086	2078
1959	35	14492	0.011	159	0.03	369	0.001	7	15	354		13971	488994	14491	3674	11764	2983
1960	34	20150	0.011	218	0.03	502	0.001	11	22	480		19441	660980	20317	5084	16571	4147
1961	33	20652	0.011	220	0.02	504	0.001	13	25	479		19940	658025	20993	5185	17203	4249
1962	32	8870	0.010	93	0.02	212	0.001	6	12	200		8571	274282	9089	2216	7484	1825
1963	31	12241	0.010	126	0.02	287	0.001	9	19	268		11837	366957	12640	3043	10458	2518
1964	30	10686	0.010	108	0.02	245	0.001	9	18	227		10342	310273	11118	2643	9245	2198
1965	29	14736	0.010	148	0.02	330	0.001	14	28	302		14273	413923	15445	3627	12906	3030
1966	28	14765	0.010	144	0.02	323	0.001	16	31	292		14314	400786	15587	3615	13091	3036
1967	27	15967	0.010	153	0.02	342	0.001	19	38	304		15492	418271	16972	3889	14329	3283
1968	26	23172	0.009	218	0.02	484	0.001	31	62	422		22501	585027	24796	5613	21045	4764
1969	25	19727	0.009	182	0.02	402	0.001	29	59	343		19172	479309	21247	4753	18131	4055
1970	24	17536	0.009	158	0.02	349	0.002	29	59	290		17056	409400	19006	4201	16308	3605
1971	23	21025	0.009	186	0.02	407	0.002	40	79	328		20471	470838	22927	5009	19783	4322
1972	22	24058	0.009	209	0.02	454	0.002	51	101	353		23446	515822	26390	5699	22902	4946
1973	21	34269	0.008	291	0.02	629	0.002	81	161	468		33430	702026	37607	8072	32999	7045
1974	20	35316	0.008	294	0.02	631	0.003	93	185	445		34484	689688	39182	8270	34398	7261
1975	19	54963	0.008	447	0.02	953	0.003	160	320	633		53723	1020728	61323	12799	54144	11301
1976	18	22196	0.008	177	0.02	374	0.003	71	143	231		21717	390898	24905	5140	22112	4564
1977	17	8457	0.008	66	0.02	138	0.004	30	59	79		8283	140809	9545	1948	8520	1739
1978	16	22543	0.008	171	0.02	357	0.004	86	172	185		22100	353604	25597	5166	22961	4636
1979	15	18501	0.007	137	0.02	283	0.004	75	150	133		18155	272332	21144	4223	19051	3805
1980	14	24612	0.007	179	0.01	364	0.004	105	210	154		24174	338435	28324	5596	25616	5061
1981	13	11248	0.007	80	0.01	161	0.004	50	99	62		11057	143738	13042	2550	11831	2313
1982	12	8276	0.007	57	0.01	114	0.004	37	73	41		8141	97689	9622	1871	8748	1701
1983	11	6994	0.007	47	0.01	93	0.004	30	60	32		6884	75720	8125	1578	7397	1437
1984	10	9243	0.007	61	0.01	118	0.004	38	75	43		9101	91014	10736	2084	9781	1898
1985	9	9177	0.007	60	0.01	113	0.004	34	68	45		9038	81346	10665	2068	9713	1884
1986	8	13765	0.006	89	0.01	162	0.003	44	89	73		13578	108626	16044	3108	14592	2827
1987	7	20389	0.006	131	0.01	229	0.003	54	108	122		20083	140579	23795	4606	21562	4177
1988	6	30971	0.007	201	0.01	332	0.002	63	126	206		30500	182999	36312	7022	32776	6338
1989	5	10834	0.007	73	0.01	111	0.001	16	31	79		10666	53332	0	0	11483	2214
1990	4	11017	0.007	79	0.01	107	0.001	10	20	87		10841	43363	0	0	11650	2246
1991	3	11231	0.008	90	0.01	103	0.000	5	11	92		11043	33129	0	0	11867	2288
1992	2	11472	0.009	109	0.01	99	0.000	2	4	95		11266	22533	0	0	12107	2332
1993	1	11745	0.012	139	0.01	96	0.000	0	1	95		11511	11511	0	0	12370	2381
1994	0	0	0.016	0	0.01	0	0.000	0	0	0	11782	11782	0	0	0	12662	2435
1995	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1996	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1997	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
TOTAL		715826		6436		13478		1393	2785	10693	11782	709087	1.5E+07	710322	158270	684753	149503
													Mean Age	21.49			

SECOND LICENSING SCHEME IMPACT MODEL

SHEET 6

							Re-Eng rq	1393									
YEAR	1995		M.Loss.Rt	0.0085	M.ExitRt	0.05144	M.Eng.Rt	0.08361									
FACTOR	0.50						'a'	15									
							'n'	2.941	Re-Eng	New Build	New Build	Revised		1988	1988	1995	1995
		Init Fleet	Constr. Total Loss		Voluntary Exits		Re-Eng Required		Absorbed	Available	Actual	Total	Age	TOTAL	TOTAL	TOTAL	TOTAL
Year Built	Age	No. VCU	Rate	VCU	Rate	VCU	Rate	VCU	VCU	VCU	VCU	VCU	Calc	POWER	TONNAGE	POWER	TONNAGE
1900	95	0	0.022	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1901	94	0	0.022	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1902	93	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1903	92	132	0.021	3	0.05	7	0.000	0	0	7		122	11260	54	46	32	27
1904	91	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1905	90	122	0.021	3	0.05	6	0.000	0	0	6		113	10200	53	42	32	25
1906	89	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1907	88	292	0.021	6	0.05	15	0.000	0	0	15		271	23854	136	101	82	61
1908	87	69	0.020	1	0.05	3	0.000	0	0	3		64	5607	33	24	20	14
1909	86	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1910	85	34	0.020	1	0.05	2	0.000	0	0	2		31	2648	17	11	10	7
1911	84	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1912	83	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1913	82	473	0.019	9	0.05	23	0.000	0	0	23		441	38125	260	158	161	98
1914	81	100	0.019	2	0.05	5	0.000	0	0	5		93	7567	56	33	35	21
1915	80	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1916	79	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1917	78	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1918	77	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1919	76	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1920	75	145	0.018	3	0.05	7	0.000	0	0	7		135	10150	92	47	59	30
1921	74	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1922	73	149	0.018	3	0.05	7	0.000	0	0	7		140	10190	99	48	64	31
1923	72	26	0.018	0	0.04	1	0.000	0	0	1		24	1727	17	8	11	5
1924	71	120	0.017	2	0.04	5	0.000	0	0	5		113	7992	82	38	54	25
1925	70	97	0.017	2	0.04	4	0.000	0	0	4		91	6360	66	30	44	20
1926	69	69	0.017	1	0.04	3	0.000	0	0	3		65	4488	49	22	33	14
1927	68	176	0.017	3	0.04	7	0.000	0	0	7		165	11232	127	55	84	36
1928	67	57	0.017	1	0.04	2	0.000	0	0	2		54	3619	42	18	28	12
1929	66	576	0.017	10	0.04	24	0.000	0	0	24		543	35840	430	178	288	119
1930	65	641	0.016	11	0.04	26	0.000	0	0	26		605	39303	486	197	327	133
1931	64	738	0.016	12	0.04	30	0.000	0	0	29		697	44578	567	225	384	153
1932	63	422	0.016	7	0.04	17	0.000	0	0	17		398	25096	329	128	224	87
1933	62	534	0.016	8	0.04	21	0.000	0	0	21		504	31268	422	161	289	110
1934	61	1006	0.016	16	0.04	39	0.000	0	0	39		952	58054	806	302	555	208
1935	60	460	0.015	7	0.04	17	0.000	0	0	17		436	26143	374	138	259	95
1936	59	486	0.015	7	0.04	18	0.000	0	0	18		461	27178	400	145	278	100
1937	58	532	0.015	8	0.04	20	0.000	0	0	20		504	29225	443	157	309	110
1938	57	544	0.015	8	0.04	20	0.000	0	0	20		516	29403	459	160	322	112
1939	56	845	0.015	12	0.04	30	0.000	0	0	30		802	44907	721	247	509	174
1940	55	385	0.015	6	0.04	14	0.000	0	0	14		366	20125	333	112	236	79
1941	54	543	0.014	8	0.04	19	0.000	0	0	19		516	27865	475	157	336	112
1942	53	1402	0.014	20	0.03	48	0.000	0	0	48		1334	70696	1240	404	868	289
1943	52	943	0.014	13	0.03	32	0.000	0	0	32		898	46687	843	270	607	194
1944	51	1719	0.014	24	0.03	58	0.000	0	0	57		1638	83543	1554	490	1125	355
1945	50	1167	0.014	16	0.03	39	0.000	0	0	38		1113	55658	1067	331	776	241
1946	49	3560	0.014	48	0.03	116	0.000	1	1	115		3397	166458	3287	1004	2403	734
1947	48	4732	0.013	63	0.03	151	0.000	1	2	150		4518	216881	4413	1327	3243	975
1948	47	4448	0.013	59	0.03	140	0.000	1	2	138		4250	199752	4190	1241	3094	917
1949	46	4679	0.013	61	0.03	145	0.000	1	2	143		4474	205797	4450	1299	3303	964
1950	45	4523	0.013	58	0.03	138	0.000	1	2	136		4328	194781	4344	1249	3241	932
1951	44	1395	0.013	18	0.03	42	0.000	0	1	41		1336	58775	1352	383	1014	287
1952	43	1482	0.012	18	0.03	44	0.000	0	1	43		1420	61072	1450	405	1093	305
1953	42	2345	0.012	29	0.03	68	0.000	1	1	67		2249	94443	2314	637	1754	483
1954	41	6339	0.012	77	0.03	180	0.000	2	4	177		6084	249435	6312	1713	4807	1305
1955	40	6887	0.012	82	0.03	193	0.000	2	4	188		6625	264984	6927	1854	5303	1419
1956	39	9245	0.012	108	0.03	254	0.000	3	7	247		8886	346567	9362	2472	7206	1902
1957	38	12330	0.012	142	0.03	332	0.000	5	10	323		11860	450681	12568	3278	9741	2537
1958	37	9723	0.011	110	0.03	257	0.000	4	8	249		9360	346302	10006	2571	7784	2000
1959	36	13971	0.011	156	0.03	362	0.000	7	13	349		13459	484532	14491	3674	11333	2873
1960	35	19441	0.011	214	0.03	495	0.001	10	20	474		18742	655982	20317	5084	15976	3998
1961	34	19940	0.011	216	0.03	497	0.001	12	23	474		19239	654115	20993	5185	16598	4100
1962	33	8571	0.011	91	0.02	209	0.001	6	11	198		8276	273114	9089	2216	7226	1762
1963	32	11837	0.010	124	0.02	283	0.001	8	17	266		11439	366038	12640	3043	10106	2433
1964	31	10342	0.010	106	0.02	242	0.001	8	16	226		10002	310063	11118	2643	8940	2126
1965	30	14273	0.010	144	0.02	327	0.001	13	25	302		13815	414436	15445	3827	12491	2933
1966	29	14314	0.010	142	0.02	321	0.001	14	28	292		13865	402088	15587	3815	12681	2941
1967	28	15492	0.010	151	0.02	339	0.001	17	34	305		15018	420513	16972	3889	13891	3183
1968	27	22501	0.010	215	0.02	481	0.001	25	56	426		21632	589466	24796	5613	20420	4622
1969	26	19172	0.009	160	0.02	401	0.001	27	53	347		18616	484078	21247	4753	17607	3938
1970	25	17058	0.009	157	0.02	348	0.002	27	53	295		16580	414501	19006	4201	15851	3504
1971	24	20471	0.009	185	0.02	407	0.002	36	71	336		19915	477962	22927	5009	19246	4205
1972	23	23446	0.009	208	0.02	454	0.002	46	92	362		22631	525103	26390	5699	22360	4816
1973	22	33430	0.009	290	0.02	631	0.002	73	147	484		32582	716814	37807	8072	32163	6867
1974	21	34484	0.008	293	0.02	633	0.002	85	169	464		33643	706501	39182	8270	33558	7083
1975	20	53723	0.008	447	0.02	959	0.003	147	294	665		52464	1049271	61323	12799	52875	11036
1976	19	21717	0.008	177	0.02	377	0.003	66	132	245		21229	403352	24905	5140	21616	4461
1977	18	8283	0.008	66	0.02	139	0.003	28	56	84		8105	145894	9546	1948	8337	1702
1978	17	22100	0.008	172	0.02	361	0.004	81	162	199		21648	368021	25587	5168	22491	4541
1979	16	18155	0.008	138	0.02	287	0.004	72	144	143		17802	284834	21144	4223	18680	3731
1980	15	24174	0.007	180	0.02	370	0.004	102	205	165		23727	355898	28324	5596	25142	4968
1981	14	11057	0.007	80	0.01	164	0.004	49	98	65		10862	152068	13042	2550	11623	2272
1982	13	8141	0.007	58	0.01	116	0.005	37	75	42		8004	104052	9622	1871	8601	1673
1983	12	6884	0.007	46	0.01	95	0.005	32	63	31		6773	81273	8125	1576	7278	1414
1984	11	9101	0.007	62	0.01	121	0.005	41	82	39		8960	98559	10736	2084	9629	1869
1985	10	9038	0.007	60	0.01	115	0.004	38	77	39		8901	89014	10665	2068	9566	1855
1986	9	13578	0.007	89	0.01	167	0.004	52	105	62		13376	120381	16044	3108	14374	2785
1987	8	20083	0.006	129	0.01	236	0.003	67	134	102		19785	158276	23795	4606	21261	4115
1988	7	30500	0.006	196	0.01	343	0.003	84	168	175		30045	210313	36312	7022	32287	6243
1989	6	10666	0.007	69	0.01	114	0.002	23	45	69		10505	63031	0	0	11259	2161
1990	5	10841	0.007	73	0.01	111	0.002	16	33	78		10673	53366	0	0	11470	2214
1991	4	11043	0.007	79	0.01	107	0.001	11	21	86		10807	43467	0	0	11678	2252
1992	3	11266	0.006	91	0.01	103	0.001	6	11	92		11078	33234	0	0	11905	2293
1993	2	11511	0.009	109	0.01	100	0.000	2	4	95		11304	22608	0	0	12148	2338
1994	1	11782	0.012	140	0.01	96	0.000	0	1	95		11547	11547	0	0	12409	2386
1995	0	0	0.016	0	0.01	0	0.000	0	0	0	11815	11815	0	0	0	12697	2439
1996	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
1997	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
TOTAL		709087		6438		13540		1393	2785	10755	11815	702317	1.5E+07	710322	158270	660196	146009
													Mean Age	22.00			

SECOND LICENSING SCHEME IMPACT MODEL

SHEET 9

							Re-Eng rq	1393									
YEAR	1996		M.Loss.Rt	0.0085	M.ExitRt	0.05144	M.Eng.Rt	0.0872									
FACTOR	0.50						'a'	15									
							'n'	2.941	Re-Eng	New Build	New Build	Revised		1988	1988	1996	1996
		Init Fleet	Constr. Total Loss		Voluntary Exits		Re-Eng Required		Absorbed	Available	Actual	Total	Age	TOTAL	TOTAL	TOTAL	TOTAL
Year Built	Age	No. VCU	Rate	VCU	Rate	VCU	Rate	VCU	VCU	VCU	VCU	VCU	Calc	POWER	TONNAGE	POWER	TONNAGE
1900	96	0	0.022	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1901	95	0	0.022	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1902	94	0	0.022	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1903	93	122	0.021	3	0.05	6	0.000	0	0	6		114	10566	54	46	30	26
1904	92	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1905	91	113	0.021	2	0.05	6	0.000	0	0	6		105	9577	53	42	30	24
1906	90	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1907	89	271	0.021	6	0.05	14	0.000	0	0	14		252	22411	136	101	76	56
1908	88	64	0.021	1	0.05	3	0.000	0	0	3		60	5269	33	24	19	13
1909	87	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1910	86	31	0.020	1	0.05	2	0.000	0	0	2		29	2490	17	11	10	6
1911	85	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1912	84	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1913	83	441	0.020	9	0.05	22	0.000	0	0	22		410	34042	260	158	150	91
1914	82	93	0.019	2	0.05	5	0.000	0	0	5		87	7137	56	33	33	19
1915	81	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1916	80	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1917	79	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1918	78	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1919	77	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1920	76	135	0.018	2	0.05	6	0.000	0	0	6		127	9624	92	47	55	28
1921	75	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1922	74	140	0.018	3	0.05	6	0.000	0	0	6		131	9680	99	48	60	29
1923	73	24	0.018	0	0.05	1	0.000	0	0	1		22	1642	17	8	11	5
1924	72	113	0.018	2	0.04	5	0.000	0	0	5		106	7606	82	38	51	23
1925	71	91	0.017	2	0.04	4	0.000	0	0	4		85	6058	68	30	42	19
1926	70	65	0.017	1	0.04	3	0.000	0	0	3		61	4279	49	22	31	13
1927	69	165	0.017	3	0.04	7	0.000	0	0	7		155	10719	127	55	79	34
1928	68	54	0.017	1	0.04	2	0.000	0	0	2		51	3457	42	18	26	11
1929	67	543	0.017	9	0.04	23	0.000	0	0	22		511	34267	430	176	272	112
1930	66	605	0.017	10	0.04	25	0.000	0	0	25		570	37614	486	197	309	125
1931	65	697	0.016	11	0.04	28	0.000	0	0	28		657	42703	567	225	363	144
1932	64	398	0.016	6	0.04	16	0.000	0	0	16		376	24064	329	128	211	82
1933	63	504	0.016	8	0.04	20	0.000	0	0	20		476	30010	422	161	273	104
1934	62	952	0.016	15	0.04	37	0.000	0	0	37		900	55774	806	302	524	196
1935	61	436	0.016	7	0.04	17	0.000	0	0	17		412	25141	374	138	245	90
1936	60	461	0.015	7	0.04	17	0.000	0	0	17		436	26163	400	145	263	95
1937	59	504	0.015	8	0.04	19	0.000	0	0	19		477	28162	443	167	293	104
1938	58	516	0.015	8	0.04	19	0.000	0	0	19		489	28362	459	160	305	106
1939	57	802	0.015	12	0.04	29	0.000	0	0	29		761	43362	721	247	483	165
1940	56	366	0.015	5	0.04	13	0.000	0	0	13		347	19453	333	112	224	75
1941	55	516	0.015	8	0.04	18	0.000	0	0	18		490	26963	475	167	321	106
1942	54	1334	0.014	19	0.04	47	0.000	0	0	46		1268	68480	1240	404	844	275
1943	53	898	0.014	13	0.03	31	0.000	0	0	31		854	45272	843	270	578	185
1944	52	1638	0.014	23	0.03	56	0.000	0	0	55		1560	81101	1554	490	1071	338
1945	51	1113	0.014	15	0.03	37	0.000	0	0	37		1061	54090	1067	331	739	229
1946	50	3397	0.014	47	0.03	112	0.000	0	1	111		3239	161953	3287	1004	2291	700
1947	49	4518	0.014	61	0.03	147	0.000	1	1	145		4311	211252	4413	1327	3094	931
1948	48	4250	0.013	57	0.03	136	0.000	1	1	134		4058	194793	4190	1241	2954	875
1949	47	4474	0.013	59	0.03	141	0.000	1	2	139		4275	200926	4450	1299	3157	921
1950	46	4328	0.013	56	0.03	134	0.000	1	2	132		4139	190399	4344	1249	3099	891
1951	45	1336	0.013	17	0.03	41	0.000	0	1	40		1278	57523	1352	383	970	275
1952	44	1420	0.013	18	0.03	43	0.000	0	1	42		1360	59846	1450	405	1047	292
1953	43	2249	0.012	28	0.03	66	0.000	1	1	65		2155	92665	2314	637	1681	463
1954	42	6084	0.012	75	0.03	176	0.000	2	3	173		5835	245058	6312	1713	4611	1251
1955	41	6625	0.012	80	0.03	189	0.000	2	4	184		6358	260682	6927	1854	5090	1362
1956	40	8886	0.012	106	0.03	248	0.000	3	6	242		8535	341406	9362	2472	6921	1827
1957	39	11860	0.012	139	0.03	326	0.000	4	9	317		11400	444592	12588	3276	9363	2438
1958	38	9360	0.012	108	0.03	252	0.000	4	8	245		9003	342116	10006	2571	7488	1924
1959	37	13459	0.011	153	0.03	356	0.000	6	12	344		12956	479386	14491	3674	10910	2766
1960	36	18742	0.011	210	0.03	486	0.000	9	18	468		18056	650009	20317	5084	15391	3851
1961	35	19239	0.011	212	0.03	489	0.001	10	21	468		18548	649183	20993	5185	16002	3953
1962	34	8276	0.011	90	0.03	206	0.001	5	10	196		7985	271498	9089	2216	6972	1700
1963	33	11439	0.011	122	0.02	279	0.001	8	15	264		11045	364490	12640	3043	9758	2349
1964	32	10002	0.010	105	0.02	239	0.001	7	15	224		9668	309296	11118	2643	8639	2054
1965	31	13815	0.010	142	0.02	324	0.001	11	23	301		13360	414170	15445	3627	12081	2837
1966	30	13865	0.010	140	0.02	318	0.001	13	26	292		13420	402601	15587	3615	12274	2847
1967	29	15018	0.010	149	0.02	337	0.001	15	31	306		14548	421895	16972	3889	13456	3083
1968	28	21832	0.010	213	0.02	478	0.001	25	50	428		21166	592653	24796	5613	19797	4481
1969	27	18618	0.010	178	0.02	398	0.001	24	48	350		18066	487777	21247	4753	17084	3821
1970	26	16580	0.009	156	0.02	346	0.001	24	48	299		16102	418649	19006	4201	15394	3403
1971	25	19915	0.009	183	0.02	406	0.002	32	64	342		19358	483948	22927	5009	18707	4087
1972	24	22831	0.009	206	0.02	454	0.002	41	83	371		22212	533087	26390	5699	21696	4685
1973	23	32582	0.009	288	0.02	631	0.002	66	133	499		31729	729771	37607	8072	31321	6687
1974	22	33643	0.009	292	0.02	635	0.002	77	154	481		32793	721450	39182	8270	32711	6905
1975	21	52464	0.008	446	0.02	963	0.003	134	268	695		51189	1074959	61323	12799	51590	10768
1976	20	21229	0.008	177	0.02	379	0.003	60	121	258		20734	414678	24905	5140	21112	4357
1977	19	8105	0.008	66	0.02	141	0.003	26	51	89		7924	150561	9545	1948	8151	1664
1978	18	21648	0.008	172	0.02	365	0.003	75	151	214		21187	381364	25597	5168	22012	4444
1979	17	17802	0.008	138	0.02	291	0.004	68	136	155		17441	296492	21144	4223	18301	3655
1980	16	23727	0.008	180	0.02	375	0.004	98	196	180		23269	372297	28324	5596	24657	4872
1981	15	10862	0.007	81	0.02	166	0.004	48	96	71		10663	159943	13042	2550	11410	2230
1982	14	8004	0.007	58	0.01	119	0.005	37	74	44		7864	110103	9622	1871	8452	1644
1983	13	6773	0.007	48	0.01	97	0.005	32	65	32		6660	86583	8125	1578	7157	1391
1984	12	8960	0.007	62	0.01	124	0.005	43	86	38		8817	105807	10736	2084	9475	1839
1985	11	8901	0.007	60	0.01	118	0.005	42	83	35		8765	95411	10665	2068	9419	1826
1986	10	13376	0.007	89	0.01	171	0.004	59	118	53		13175	131753	16044	3108	14159	2743
1987	9	19785	0.007	129	0.01	243	0.004	79	159	84		19492	175432	23795	4606	20947	4054
1988	8	30045	0.006	194	0.01	353	0.003	105	209	144		29603	236821	36312	7022	31812	6152
1989	7	10505	0.006	68	0.01	118	0.003	30	60	58		10350	72447	0	0	11122	2149
1990	6	10673	0.007	69	0.01	115	0.002	24	47	68		10513	63077	0	0	11298	2180
1991	5	10867	0.007	73	0.01	111	0.002	17	34	77		10700	53498	0	0	11498	2217
1992	4	11078	0.007	80	0.01	107	0.001	11	22	86		10902	43607	0	0	11715	2257
1993	3	11304	0.008	91	0.01	104	0.001	6	12	92		11115	33346	0	0	11945	2299
1994	2	11547	0.009	109	0.01	100	0.000	2	5	95		11340	22680	0	0	12187	2343
1995	1	11815	0.012	140	0.01	96	0.000	0	1	95		11580	11580	0	0	12444	2390
1996	0	0	0.016	0	0.01	0	0.000	0	0	0	11842	11842	0	0	0	12726	2444
1997	0	0	0.016	0	0.01	0	0.000	0	0	0		0	0	0	0	0	0
TOTAL		702317		6439		13592		1393	2785	10807	11842	695522	1.6E+07	710322	158270	675565	146509
													Mean Age	22.49			

							Re-Eng rq	1393									
YEAR	1997		M.Loss.Rt	0.0085	M.ExitRt	0.05144	M.Eng.Rt	0.09064									
FACTOR	0.50						'a'	15									
							'n'	2.941	Re-Eng	New Build	New Build	Revised		1988	1988	1997	1997
		Init Fleet	Constr. Total Loss		Voluntary Exits		Re-Eng Required		Absorbed	Available	Actual	Total	Age	TOTAL	TOTAL	TOTAL	TOTAL
Year Built	Age	No.VCU	Rate	VCU	Rate	VCU	Rate	VCU	VCU	VCU	VCU	VCU	Calc	POWER	TONNAGE	POWER	TONNAGE
1900	97	0	0.022	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1901	96	0	0.022	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1902	95	0	0.022	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1903	94	114	0.022	2	0.05	6	0.000	0	0	6		105	9912	54	46	28	24
1904	93	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1905	92	105	0.021	2	0.05	5	0.000	0	0	5		98	8989	53	42	28	22
1906	91	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1907	90	252	0.021	5	0.05	13	0.000	0	0	13		234	21049	136	101	71	52
1908	89	60	0.021	1	0.05	3	0.000	0	0	3		56	4951	33	24	17	12
1909	88	0	0.021	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1910	87	29	0.020	1	0.05	1	0.000	0	0	1		27	2341	17	11	9	6
1911	86	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1912	85	0	0.020	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1913	84	410	0.020	8	0.05	20	0.000	0	0	20		382	32052	260	158	139	85
1914	83	87	0.020	2	0.05	4	0.000	0	0	4		81	6725	56	33	30	18
1915	82	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1916	81	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1917	80	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1918	79	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1919	78	0	0.019	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1920	77	127	0.019	2	0.05	6	0.000	0	0	6		116	9118	92	47	52	26
1921	76	0	0.018	0	0.05	0	0.000	0	0	0		0	0	0	0	0	0
1922	75	131	0.018	2	0.05	6	0.000	0	0	6		122	9187	99	48	56	27
1923	74	22	0.018	0	0.05	1	0.000	0	0	1		21	1560	17	8	10	5
1924	73	106	0.018	2	0.05	5	0.000	0	0	5		99	7231	82	38	47	22
1925	72	85	0.018	2	0.04	4	0.000	0	0	4		80	5765	66	30	39	18
1926	71	61	0.017	1	0.04	3	0.000	0	0	3		57	4076	49	22	29	13
1927	70	155	0.017	3	0.04	7	0.000	0	0	7		146	10219	127	55	75	32
1928	69	51	0.017	1	0.04	2	0.000	0	0	2		48	3299	42	18	25	10
1929	68	511	0.017	9	0.04	21	0.000	0	0	21		481	32732	430	176	256	106
1930	67	570	0.017	10	0.04	24	0.000	0	0	24		537	35962	486	197	291	118
1931	66	657	0.017	11	0.04	27	0.000	0	0	27		619	40867	567	225	342	136
1932	65	376	0.016	6	0.04	15	0.000	0	0	15		355	23051	329	128	199	78
1933	64	476	0.016	8	0.04	19	0.000	0	0	19		450	28776	422	161	257	98
1934	63	900	0.016	14	0.04	36	0.000	0	0	35		850	53531	806	302	495	186
1935	62	412	0.016	7	0.04	16	0.000	0	0	16		390	24154	374	138	231	85
1936	61	436	0.016	7	0.04	17	0.000	0	0	17		412	25161	400	145	249	90
1937	60	477	0.015	7	0.04	18	0.000	0	0	18		452	27110	443	157	277	98
1938	59	489	0.015	7	0.04	18	0.000	0	0	18		463	27331	459	160	289	101
1939	58	761	0.015	12	0.04	28	0.000	0	0	28		721	41827	721	247	456	157
1940	57	347	0.015	5	0.04	13	0.000	0	0	13		330	18783	333	112	213	72
1941	56	490	0.015	7	0.04	18	0.000	0	0	18		465	26063	475	157	305	101
1942	55	1268	0.015	19	0.04	45	0.000	0	0	45		1205	66263	1240	404	802	261
1943	54	854	0.014	12	0.04	30	0.000	0	0	30		812	43853	843	270	549	176
1944	53	1560	0.014	22	0.03	54	0.000	0	0	53		1484	78644	1554	490	1019	321
1945	52	1061	0.014	15	0.03	36	0.000	0	0	36		1010	52509	1067	331	704	218
1946	51	3239	0.014	45	0.03	108	0.000	0	1	108		3086	157393	3287	1004	2183	667
1947	50	4311	0.014	59	0.03	142	0.000	1	1	141		4111	205535	4413	1327	2950	887
1948	49	4058	0.014	55	0.03	132	0.000	1	1	130		3872	189739	4190	1241	2819	835
1949	48	4275	0.013	57	0.03	137	0.000	1	2	135		4082	195939	4450	1299	3014	879
1950	47	4139	0.013	54	0.03	130	0.000	1	2	129		3955	185893	4344	1249	2961	851
1951	46	1278	0.013	17	0.03	40	0.000	0	1	39		1222	56230	1352	383	926	263
1952	45	1360	0.013	17	0.03	41	0.000	0	1	41		1302	58572	1450	405	1002	280
1953	44	2155	0.013	27	0.03	65	0.000	1	1	64		2064	90805	2314	637	1609	443
1954	43	5835	0.012	73	0.03	172	0.000	2	3	169		5592	240447	6312	1713	4419	1199
1955	42	6358	0.012	78	0.03	184	0.000	2	4	180		6098	256110	6927	1854	4882	1307
1956	41	8535	0.012	103	0.03	243	0.000	3	5	237		8192	335867	9362	2472	6643	1754
1957	40	11400	0.012	136	0.03	319	0.000	4	8	311		10949	437978	12588	3278	8993	2342
1958	39	9003	0.012	106	0.03	247	0.000	3	7	240		8654	337500	10006	2571	7197	1849
1959	38	12956	0.012	150	0.03	349	0.000	5	11	338		12463	473600	14491	3674	10494	2661
1960	37	18056	0.011	205	0.03	477	0.000	8	17	461		17382	643117	20317	5084	14816	3707
1961	36	18548	0.011	207	0.03	481	0.001	9	19	462		17869	643285	20993	5165	15417	3808
1962	35	7985	0.011	88	0.03	203	0.001	5	9	194		7699	269457	9089	2216	6722	1639
1963	34	11045	0.011	120	0.03	275	0.001	7	14	262		10657	362342	12640	3043	9415	2267
1964	33	9666	0.011	103	0.02	236	0.001	7	13	223		9333	307996	11118	2643	8342	1983
1965	32	13360	0.010	140	0.02	320	0.001	10	21	299		12911	413158	15445	3627	11674	2741
1966	31	13420	0.010	138	0.02	314	0.001	12	23	291		12979	402356	15567	3615	11870	2753
1967	30	14548	0.010	147	0.02	333	0.001	14	28	306		14082	422450	16972	3869	13025	2984
1968	29	21166	0.010	210	0.02	474	0.001	23	45	429		20504	594627	24796	5613	19176	4341
1969	28	18066	0.010	176	0.02	396	0.001	22	43	353		17516	490437	21247	4753	16564	3705
1970	27	16102	0.010	154	0.02	345	0.001	22	43	301		15625	421870	19008	4201	14938	3302
1971	26	19358	0.009	182	0.02	404	0.002	29	58	346		18801	488820	22927	5009	18169	3970
1972	25	22212	0.009	205	0.02	453	0.002	37	75	378		21592	539799	26390	5699	21090	4555
1973	24	31729	0.009	287	0.02	631	0.002	60	120	511		30872	740922	37807	8072	30474	6506
1974	23	32793	0.009	290	0.02	635	0.002	69	139	496		31937	734551	39182	8270	31657	6724
1975	22	51189	0.009	444	0.02	986	0.002	121	243	723		49900	1097805	61323	12799	50292	10497
1976	21	20734	0.008	176	0.02	381	0.003	55	110	271		20232	424874	24905	5140	20601	4252
1977	20	7924	0.008	66	0.02	141	0.003	23	47	95		7740	154806	9545	1948	7982	1625
1978	19	21187	0.008	172	0.02	368	0.003	70	139	229		20716	393613	25597	5168	21523	4346
1979	18	17441	0.008	139	0.02	294	0.004	63	126	167		17071	307284	21144	4223	17913	3578
1980	17	23269	0.008	181	0.02	380	0.004	92	184	196		22800	387594	28324	5596	24160	4774
1981	16	10653	0.008	81	0.02	169	0.004	46	91	77		10459	167340	13042	2550	11191	2188
1982	15	7864	0.007	58	0.02	120	0.005	36	72	48		7722	115825	9622	1871	8298	1614
1983	14	6650	0.007	48	0.01	99	0.005	32	64	34		6545	91635	8125	1578	7034	1367
1984	13	8817	0.007	62	0.01	126	0.005	44	87	39		8672	112741	10736	2084	9320	1809
1985	12	8765	0.007	61	0.01	121	0.005	44	87	33		8627	103522	10665	2068	9271	1798
1986	11	13175	0.007	89	0.01	175	0.005	64	128	47		12975	142728	16044	3108	13944	2701
1987	10	19492	0.007	129	0.01	249	0.005	90	179	70		19204	192038	23795	4606	20637	3994
1988	9	29603	0.007	193	0.01	363	0.004	124	247	116		29170	262532	36312	7022	31348	6062
1989	8	10350	0.006	67	0.01	122	0.004	37	75	47		10199	81590	0	0	10960	2117
1990	7	10513	0.006	68	0.01	116	0.003	31	63	56		10358	72508	0	0	11131	2148
1991	6	10700	0.007	70	0.01	115	0.002	25	49	66		10540	63237	0	0	11326	2184
1992	5	10902	0.007	73	0.01	111	0.002	18	35	76		10735	53673	0	0	11536	2222
1993	4	11115	0.007	80	0.01	108	0.001	11	23	85		10939	43756	0	0	11755	2262
1994	3	11340	0.008	91	0.01	104	0.001	6	12	92		11151	33453	0	0	11983	2304
1995	2	11580	0.009	110	0.01	100	0.000	2	5	95		11372	22744	0	0	12221	2348
1996	1	11842	0.012	140	0.01	96	0.000	0	1	96		11606	11606	0	0	12472	2395
1997	0	0	0.016	0	0.01	0	0.000	0	0	0	11862	11862	0	0	0	12747	2448
TOTAL		895522		6438		13633		1393	2785	10648	11862	688705	1.6E+07	710322	158270	670863	145006
													Mean Age	22.97			