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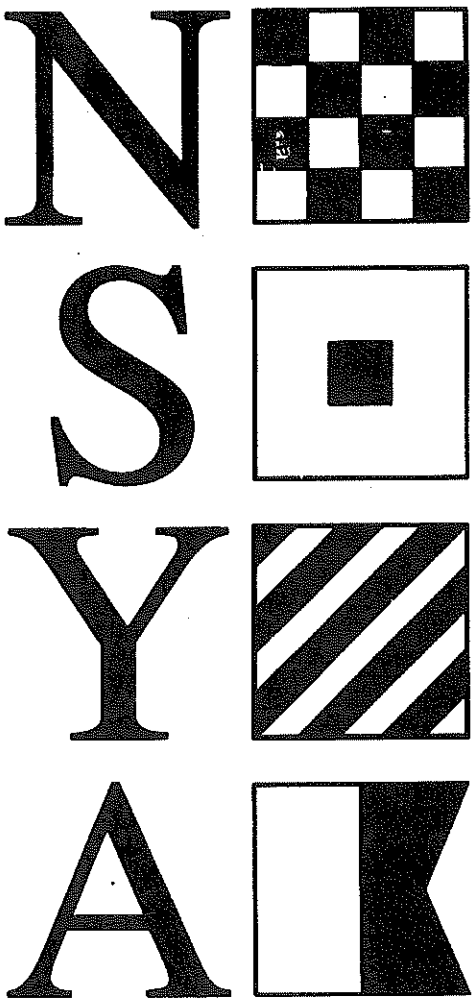

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PERFORMANCE HANDICAPPING MANUAL

1993

NOVA SCOTIA YACHTING ASSOCIATION

PERFORMANCE HANDICAPPING MANUAL - 1993

PREFACE

The 1978 CYA "Handicapping Manual", written by John Tinker, remains a valuable introduction to the subject and provides an excellent description of handicapping by methods using USYRU and RYA Portsmouth Numbers. Since 1978 however, popularity has shifted away from these to methods used by Performance Handicap Racing Fleets (PHRF). A full description of PHRF methods is the purpose of a new CYA manual, although correlation between different handicapping methods is also discussed. The title "Performance Handicapping Manual" is used, both to differentiate this from its predecessor, and to indicate that measurement systems of handicapping (IMS,IOR,etc.) are not covered.

This NSYA manual is identical to the CYA one, except for the omission of Chapter 3 and its annex, which presents PHRF ratings for Canadian fleets. It has proven difficult to keep this sufficiently current to be useful. Moreover, Nova Scotia clubs will be more interested in PHRF-New England and adjacent US fleets. The complete list of PHRF handicaps is available from USSA at reasonable price.

Chapter One introduces basic principles governing all handicap systems, and explains the differences between various methods of rating and time correction.

Chapter Two describes the methods of handicapping followed in common by all the many Performance Handicap Racing Fleets (PHRF).

Chapter Four suggests procedures for a typical new PHR Fleet, including rating adjustments, reviews and appeals.

Chapter Five provides more detail on a specific fleet (NSYA), introducing the alternative method of time-on-time correction.

Chapter Six is a compilation of guidelines to Race Committees for organizing handicap racing events, of interest regardless of the system used.

Chapter Seven explains methods of correlating different handicap systems, with emphasis on conversion between time-on-time and time-on-distance corrections.

This manual has been written primarily for new members of Race and Handicap Committees. However, technical material is confined to Chapter Seven, so with that possible exception, we hope that all yachtsmen will find the manual interesting and useful. We welcome suggestions for improving future editions.

CYA Handicap Committee

Michael C. Eames

PERFORMANCE HANDICAPPING MANUAL - 1993

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CHAPTER ONE

PRINCIPLES OF HANDICAPPING

1.1 INTRODUCTION

For as long as different designs of yachts have raced together, skippers have searched for a fair method of handicapping. We will all be happier in our appreciation of handicapping if we begin by accepting the impossibility of achieving a perfect system. So many variables affect the speed of yachts that no formula can accurately predict, nor any assessment of race results accurately measure, their performance under all conditions that may arise.

Bearing in mind that good races are won by seconds, the order of accuracy we seek in a handicapping system is extreme. To be correct within ten seconds, say, in a three hour race, we would need to estimate relative speeds, and apply corrections, to an accuracy better than 1 in 1000. In fact, we cannot hope to be better than 1 in 100, on average, and conditions in some races will inevitably cause larger errors. Hence there will always be grounds for complaint. Indeed it has been suggested that the ideal handicapping system would be one that caused every competitor to grumble equally.

The best that we can aim to do is to approximate conditions that would exist in one-design racing in average local weather, in order to provide enjoyable, albeit not completely fair racing.

There is an important principle embodied in this aim, which is often misunderstood. In one-design racing, all yachts are of the same design and thus have the same potential speed. However, they will not all be equally well maintained; their sails will not be of the same quality, and the ability of their skippers and crews will vary widely. All the major handicapping systems similarly seek to equalize the potential performance of yacht designs, but not the individual performance of each yacht and her crew. In a properly handicapped race, the best maintained and best sailed yacht should always win, as in one-design racing.

For special purposes, to encourage newcomers to internal Club racing, for example, a golf-like handicap based on an individual's performance may be desired. We shall see in Section 5.4 that simple modifications can be made to do this, but the major handicapping systems all aim to allow the best man to win.

In this chapter, we will describe the major systems in current use, other than Portsmouth Numbers which were thoroughly covered in the 1978 CYA Handicapping Manual. Advice to those seeking a new and better system is that "the other man's field always looks greener". One should select a new system based on the applicability and convenience of its features, not in the hope that it will solve problems of inaccuracy.

It is important to appreciate that handicapping involves two quite separate steps:

1. Rating the potential speed of a yacht,
2. Correcting her elapsed time.

Because a particular rating system is popularly associated with a particular method of time correction, these two steps tend to be lumped together as "the IOR method" or "the PHRF method", etc. In fact, they are separate and using different combinations can yield advantages.

1.2 RATING

In principle, there are two methods of rating the potential speed of a yacht:

1. Measurement rating, according to some formula or rule,
2. Performance rating, according to the results of races.

Measurement rating has traditionally been the prestigious method, both for restricted class racing (under the IYRU Rule or Universal Rule, for example) and for handicap racing, particularly in the ocean racing fleets. Their premiere measurement rule is the International Offshore Rule (IOR). In the future, more accurate formulations may evolve with advances in computer-based measurement techniques. The International Measurement System (IMS) is the first example of these, and is already challenging the IOR for supremacy.

The main reason that measurement rating is favoured for most prestigious events is that judgement plays no part. A yacht's rating is uniquely determined by measurements which can (in theory) be taken as precisely as needed by the formula. For everyday racing, however, measurement rating has two disadvantages. First, the complexity of today's formulae demands many measurements and frequent updating, thus incurring a significant expense. Second, no formula can be fair to all possible designs, and a clever designer will be able to "beat the rule" by designing a yacht that will sail faster than the formula claims it should. Thus there is always the risk of finding oneself the owner of an obsolete yacht, despite ameliorating effect of age allowances and periodic revisions of the rule.

Although originally intended to rate all designs of yachts equitably, a measurement rule inevitably causes a particular style of yacht to evolve, as designers learn features that best exploit the rule. This is not a handicapping problem, but there is no guarantee that such development will lead to a style of yacht which is desirable except for racing under that particular rule.

Historically, there have always been one or two prestigious measurement rules in vogue, together with a wide variety of simpler local rating methods, less costly to owners. Because the simpler measurement rules have usually proved disappointing, local methods have increasingly turned to performance rating.

The first performance rating method to gain wide acceptance outside its local area of origin was the Portsmouth Number system, but with its growth came a lack of local control and delays in updating the numbers. To meet local needs in the US, with the rapid expansion of racing-cruiser designs coming on the market in the 1970s, a number of performance handicap racing fleets (PHRF) evolved. As described in Chapter 2, the rating concept is common, but each fleet has its own Handicap Committee, evaluating local race results and updating the handicaps periodically.

Today there are over 100 fleets in US-PHRF, all operating independently but following agreed guidelines. The great advantage of this "federated" approach is that each fleet has the guidance of the accumulated experience of all other fleets. The complete listing of handicaps published annually by US-PHRF, with amendments circulated to member fleets as they report them, is undoubtedly the most comprehensive data base for keel-boat handicapping available.

It is important to appreciate, however, that PHRF is a concept rather than one specific method. In detail, each fleet publishes its own rules and procedures, developed to suit the local racing scene. In this manual, principles followed by all fleets are described in Chapter 2, some typical fleet procedures are suggested in Chapter 4, and procedures are specified in Chapter 5 for one particular fleet, that of the Nova Scotia Yachting Association.

1.3 TIME CORRECTION

There are two ways of applying ratings to the elapsed time of a yacht to obtain her corrected time:

1. Time-on-time correction, using "time correction factors",
2. Time-on-distance correction, using "time allowances".

These are fundamentally different and will not yield the same corrected times (unless the scratch yacht happens to sail the race at one particular speed). Either can be applied to any method of rating, as we shall see in Chapter 7, but most systems present us with a time allowance (TA) or with a time correction factor (TCF), suggesting that the rating method is tied to one or the other. For example, for Portsmouth Numbers (PN), TCF = 100/PN, and time-on-time correction is traditionally used with this system.

In the case of PHRF, TA = Rating, because the ratings are stated directly as time allowances in seconds per mile. They are, nevertheless, ratings and there is no reason why a corresponding TCF cannot be used for time-on-time correction in PHRF, or a TA be used with Portsmouth Numbers. Both are commonly used with IOR ratings, time-on-distance correction being favoured in North America and time-on-time in Europe and Australia.

Time-on-time correction is the easier to apply. We simply multiply the elapsed time of each yacht by its TCF to obtain the corrected time. Time-on-distance correction requires us to know the length of the course sailed. We first multiply the TA for each yacht by the course length in nautical miles, and then subtract the resulting total allowance from each yacht's elapsed time to obtain the corrected time.

This dependence on course length introduces an additional source of error in the time-on-distance method. Course length and actual distance sailed through the water will differ significantly, depending on the proportion of windward legs and on currents in tidal waters. It appears that the time-allowance tables commonly used for IOR racing are about right for a course in which 25% of the length is sailed to windward. This is typical of most offshore races, which are also long enough for tidal effects to cancel out. However, it is less appropriate for most round-the-buoy racing, particularly if additional windward legs are introduced, as in an Olympic course.

In general, time-on-distance correction tends to favour the larger yachts in light airs and the smaller yachts in heavy winds, provided the sea is calm. Time-on-time correction tends to do the reverse, but to a smaller extent. Heavy seas affect the small boats more, so there is a general tendency for time-on-distance to favour the larger yachts. The spread of corrected times tends to be less with time-on-time correction, particularly in short round-the-buoy races. On the other hand, having the whole fleet becalmed for any length of time makes nonsense of time-on-time correction. The more usual problem is that only part of the fleet is becalmed, and no method of time correction can solve that, nor the problem of wind conditions changing after the larger yachts have finished, as so frequently occurs in evening races.

Controversy abounds as to which is the more accurate method of time correction, and will continue to do so, because the real answer is that neither of them is accurate, except under the very special set of circumstances when both produce the same result. Clubs should be encouraged to experiment with both methods - and perhaps with combinations of the two, as suggested in Section 7.7 -to determine which best suits the type of races they run and the prevailing local conditions. There is no need to follow tradition slavishly.

CHAPTER TWO

PERFORMANCE HANDICAP RACING FLEETS

2.1 INTRODUCTION

PHRF is a loosely federated system of regional organizations, each of which has its own constitution, regulations and procedures, but all working within the same principles and guidelines. A Committee of the USSA, referred to as US-PHRF, lays down these guidelines but otherwise serves only as a promotional centre of communications, not as a decision-making body. Each regional organization, referred to as a "fleet", has its own Handicap Committee responsible for establishing the handicaps used in its region. Hence there can be significant differences in PHRF ratings from fleet to fleet.

The following sections describe the common principles and guidelines followed by all PHR Fleets. Further details for any particular area should be obtained from the appropriate fleet, and since the list of these changes annually, initial advice should be sought from the USSA, Box 209, Newport, RI, 02840. (Tel 401-849-5200) An annual list of PHRF handicaps, covering all fleets, is available for purchase at that address.

2.2 U.S.-P.H.R.F. COMMITTEE

The primary objective of this Committee of the USSA is "to promote the sport of handicap racing for sailing yachts, under the PHRF system, by exchange of information and ideas which will enhance the effectiveness of the system". The following tasks have been established to further this objective.

1. To publish a national listing of base handicaps for yacht classes sailed in all the member fleets. The listed handicaps are intended to be based on potential performance of the standard yacht. The listing presents the handicaps established by member fleets throughout the United States and Canada, not centrally determined handicaps.

2. To promote the interchange of information between the member fleets, to assist new fleets in getting started, and otherwise serve the national needs of the fleets.

3. To establish guidelines for effective and representative PHRF handicapping.

The Committee comprises seven persons elected at the USSA annual general meeting from candidates nominated by the member fleets. A representative of each fleet is welcome to participate in all proceedings of the Committee. These representatives serve as the points of contact for all communications between the fleets and the Committee.

2.3 PRINCIPLES OF RATING

PHRF ratings are yacht performance handicaps. They are based on the speed potential of the yacht, determined as far as possible on observations of previous racing experience. It is the intent of PHRF handicapping that any well equipped, well maintained, and well sailed yacht has a good chance of winning. Handicaps are adjusted as needed on the basis of the yacht's performance so that each well sailed yacht has an equal opportunity to win. This is fundamental.

PHRF ratings are not intended to reflect skippers' and crews' capability. Ratings are not adjusted to encourage an inexperienced or careless skipper, and conversely, no rating adjustment is made to penalize proficiency. Intensity of competition and the influx of new and aggressive sailors require each skipper to maintain consistently high performance in order to place well.

PHRF ratings are issued only to single-hulled yachts which are ballasted so as to be self-righting. Otherwise there are few limitations. Class restrictions may be applied locally, but are not a matter for national policy.

Well designed and constructed yachts will not be made obsolete by newer designs under PHRF. As faster designs appear, they are handicapped accordingly. One of the major attractions of the PHRF system is that older yachts can race competitively with the latest designs.

PHRF discourages "rule beating". If a skipper modifies his yacht, PHRF will attempt to compensate for the new potential speed. The use of taller masts, longer spinnaker poles, extra ballast, gutted interiors or other modifications intended to increase speed will be taken into account by the rating assigned.

PHRF assumes that a yacht is equipped and tuned to race. It does not attempt to rate a yacht which differs from others in its class in that it is out of balance, has old sails, or has unusual windage (as from a dinghy on davits). However, if the basic hull and rig differ from others in its class, it will, of course be rated uniquely.

Because headsail size has so much influence on speed, PHRF uses this factor to adjust handicaps. Yachts are rated for having large or small headsails, an LP of 155%J being the dividing line in most fleets.* Once a yacht is rated with a large headsail, this rating must be used, even though wind conditions may preclude use of the sail. A skipper is not allowed to have his yacht re-rated frequently by choosing a headsail to suit race conditions.

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* Originally 150%J of LP, but most fleets have gone to 155%J to provide allowance for sails stretched beyond their original size.

2.4 P.H.R.F. BASE RATINGS

PHRF ratings are expressed directly as time allowances in seconds per nautical mile, to be deducted from elapsed times to produce corrected times. A higher rating indicates a slower boat.

Most fleets recognize 6 sec/mile as the smallest increment of performance that can be assessed reliably, but use increments of 3 sec/mile in making adjustments for minor changes of equipment and sail size.

The "base ratings" which appear in nationally published lists apply to yachts for which the following "standard configuration" applies:

(1) Spinnaker pole length is equal to "J",
(2) Spinnaker maximum width is 180% of "J",
(3) Spinnaker maximum length is 95% of jibstay length,
i.e., $0.95\sqrt{(I^2 + J^2)}$
(4) Perpendicular from clew to luff of largest headsail is between 150% and 155% of "J",
(5) Yacht is in racing condition,
(6) Yacht has a folding or feathering propeller, a two-bladed fixed propeller in aperture, or a retractable outboard motor,
(7) Hull and appendages are unmodified,
(8) IOR batten length restrictions are followed, except in cases where the standard yacht has full-length battens.

Adjustments made for deviations from standard configuration vary from fleet to fleet, because they are based on local racing experience. Each fleet publishes its own list of adjustments.

2.5 INITIAL RATINGS

To obtain a PHRF rating, an owner applies for membership in his local fleet and submits details of his yacht on the prescribed form, including a declaration of the sails that will constitute his inventory. Most fleets prohibit more than two changes of declared inventory during a season.

PHRF is an honour system, relying on the owner to provide the simple measurements necessary. If possible deviations become apparent, other contestants are encouraged to protest the yacht in question under IYRU Rule 19.

A new boat in an established class is given the rating for the class. Adjustment may be made for any deviation from the class. If adjustments are made, an indication is made in the handicap record that the yacht is non-standard.

For new classes and one-of-a-kind yachts, the rating is set initially on the basis of comparison with similar yachts with established ratings. Comparison is made considering type of design and principal dimensions. The rating is assigned conservatively, and is adjusted as performance data become available.

A skipper may experiment with different ways of improving his performance. If there are changes to the hull, rig, sails or other factors upon which rating is based, they must be reported to the Handicap Committee for evaluation.

Ratings may be appealed to the fleet Handicap Committee, either by the owner or by others. The appellant sets forth his views in writing, documenting his case with supporting information. There is no higher court of appeal; US-PHRF has resisted requests to hear appeals because this would detract from the fundamental principle of local fleet control.

2.6 VALID RACE RESULTS

The success of any performance rating system depends upon the quality of the data provided by Clubs to the Handicap Committee. This quality is determined by good judgement on the race course, and Race Officers must be aware of what constitutes a result that is valid for handicap analysis.

The principle is simple. Since we seek true relative measures of a yacht's speed, her elapsed time must reflect fair sailing over the same course and under the same conditions of wind and sea as her competitors. Times that are the result of luck, or even skill, in finding wind no other boat has found, for example, win many races fairly, but are not valid measures of boat performance.

More obvious examples are yachts clearly not sailing to their potential, with a fouled bottom, a jib half-hoisted, or a riotous party in progress on board. Race Officers should note such things on their race records, just as they would note violations of the rules. Incidentally, an error in tactics, becalming a yacht while others are not, may invalidate results more than gross violations of the racing rules. The elapsed time of a disqualified yacht may remain a perfectly valid measure of her potential speed.

PHRF ratings are intended to apply to day-time round-the-buoy races, and to offshore and overnight races in which there is a balance of windward, reaching and downwind legs, and when all the sails are permitted to be used. The system works well provided that wind conditions affect all boats equally. It is not intended for extremely short races, predominantly off-wind races, or when no changes of headsail are permitted. Consequently, results from such races are not used for handicap analysis.

PHRF ratings are being used for short evening races, but the prevalence of rapidly varying winds and restricted courses makes such results less reliable. Many fleets do not include the results of evening races in their analyses.

PHRF ratings are also being used for long offshore races, but with mixed success. Such races frequently do not experience an appropriate mix of windward, reaching and downwind legs. Moreover, the spread of speeds often causes the leaders and stragglers to be sailing in quite different conditions towards the end of a long race. Again, results of such races should not be used to analyse handicaps, unless the conditions of round-the-buoy racing have in fact been experienced.

Appointed representatives in each Club are responsible for submitting valid race results to the fleet Handicap Committee. They may or may not be members of that Committee. Frequency of Committee reviews and rating revisions varies from fleet to fleet, as does the method of notification. In some, owners receive individual certificates; in others, rating lists are circulated to the Clubs.

2.7 FLEET HANDICAP COMMITTEES

Clearly the heart of a performance handicap racing fleet is the Handicap Committee. The system depends crucially on the skill, dedication and integrity of the handicappers in analyzing race results, as well as assessing speed potential from other available information. The Committee is important both in its actions and in its image. So long as the sailors perceive that the Committee is operating without bias, allowances will be made for differences in opinion. If it is perceived that the Committee is not even-handed, unrest can grow and handicaps may assume undue prominence. This can detract from the main objects of yacht racing, which should be to improve boat speed and tactical skills.

The Handicap Committee should include a number of different points of view. There should be experienced sailors from all the different types and sizes of yachts which will be handicapped. It is important that handicappers be listeners and not talkers outside the Committee. Any handicapper is prone to be beseeched by those who would find fault with others rather than themselves. It is important to listen and console but not to agree beyond the obvious facts. The proper place for discussing the merits of handicaps is in the Committee.

There are a number of methods in effective use by the Handicap Committees. At one extreme there are PHR Fleets where essentially all of the work is done by one chief handicapper with ratification by the Committee. The other extreme has almost all the handicapping done in Committee, with individuals making few unilateral analyses. An intermediate option is popular in geographically large areas in which local handicappers do temporary handicapping for a few Clubs where they are familiar with the yachts. However, it is usually required that all handicaps be ratified by the Fleet Committee.

There are no national guidelines to advise Committees on how to review race results, and few fleets publicize the inner workings of their Committees. A typical statement is that "changes of handicaps shall be made whenever the results or other data indicate an adjustment in order to provide equitable handicap racing".

2.8 MEMBERSHIP AND EXPENSES

Most fleets operate on the basis of an annual membership fee of $10 to 20. In general this is applied to the owner so that, in change of ownership, the new owner must re-apply and the old owner has his membership carried over to a new yacht. The membership fees cover office expenses, usually including part-time secretarial assistance and support for handicappers meetings. The organization will generally purchase books and other information sources. Some fleets support computers or computer access for record maintenance and race analysis.

Chapter 3 has been deliberately omitted.

CHAPTER FOUR

TYPICAL FLEET PROCEDURES

4.1 INTRODUCTION

There is great variety in the procedures used by PHR Fleets. Chapter 2 has covered the only principles which all fleets should follow. Chapter 5 will describe the procedures of one very active fleet. At the other extreme, some fleets merely adopt the ratings developed by an active neighbour, their committees meeting only to hear an appeal against a particular rating.

The purpose of this intermediate chapter is to suggest some sound procedures that might be followed by a developing new fleet. Such a fleet will start with the base ratings of a well developed fleet that sails in similar environmental conditions and, perhaps more importantly, one that encompasses the needed types of yachts. This choice need not be confined to Canadian fleets; the complete list of "PHRF Handicaps" published by the USSA should be studied.

4.2 TYPICAL ADJUSTMENTS

Many yachts will differ from the standard configuration used for the published base ratings. Rating adjustments for these are best established by trial and error, over several racing seasons, since most adjustments are influenced by environmental conditions and the type of courses raced.

Typically however, an adjustment of 3 sec/mile is made for each 10%J difference of genoa LP away from the standard 150-155%J, considering only the largest headsail in the inventory. Oversized spinnakers and pole-lengths are similarly penalized, but there is seldom an allowance for spinnakers less than 180%J in width.

Allowances for yachts having no spinnaker at all vary widely, from 0 through 24 sec/mile, depending on rig dimensions and on the fleet's philosophy; to encourage spinnaker skills or to cater for the family short-crewed boat, for example. This remains a highly controversial subject, because the performance gain of a spinnaker can vary so widely from race to race through the season.

Full-length battens added to a mainsail may be significant or not, depending on their purpose. Some fleets have complex rules for adjustments, but our advice is to regard each yacht adding full battens as a modified type, evaluating her rating individually from race results.

Evaluation of race results is the only practical way of rating many other modifications to standard designs, such as changed keels and rudders, taller masts, stripped-out accommodations and so on. The modified yacht sails with a "provisional" rating while being evaluated (See Section 4.5).

Installation of an inboard engine in a type of yacht defined to have an outboard typically warrants an allowance of 6 sec/mile. Conversely, an outboard in lieu of inboard is penalized 6 sec/mile. For inboard installations, a fixed propeller instead of standard folding or feathering types is usually allowed 3 or 6 sec/mile for 2 or 3 blades, except for a 2 bladed propeller in an aperture.

Since PHRF is essentially an honour system, the yacht owner declaring what sails and other features he has, it is best to keep the rules and adjustments as simple as possible, avoiding the need for measurements when registering a yacht. However, to be on guard against the legal warrior or loophole seeker, it is wise to include a catch-all clause to the effect that any other feature regarded as non-standard by the Handicap Committee will be assessed on an individual basis.

4.3 RATING REVIEWS

The frequency with which fleets review their ratings varies from monthly to annually, often governed by

the ease or difficulty of holding meetings. For a review to be useful, a fair number of valid races must have been sailed and analysed; frequency is not as important as consistency.

Some systematic method of reporting race results to the fleet Handicap Committee is important, so that its members can quickly come to grips with those yachts which are sailing consistently above or below their ratings, for valid reasons. If this is not done, endless anecdotal stories of races will replace the proper work of the committee.

A threshold value of, for example, 12 sec/mile should be set. Yachts differing from their expected performance by more than this, on average over several races, are considered for a rating change. Yachts consistently within that band are not subject to discussion.

However, the "expected performance" will not always correspond to the assigned rating; allowance should be made for the "skipper effect" discussed in Section 4.4. Also, when averaging performance over several races, it is wise not to allow the mean to be unduly influenced by a single exceptional result. Exceptions abound in yacht racing, but consistency is the essence of sound handicapping.

Before changing any established rating, it is important to examine what effect that change may have on other types of yachts with similar base ratings. The committee should think in terms of "blocks" of yacht types which sail together and have closely related ratings.

When changing established ratings, it is not usually advisable to exceed 6 sec/mile at any one time. Some lag in reaching a proper figure is better than the oscillations that can result from trying to match current performance precisely. This normal limit does not apply to provisional ratings, of course, which should be brought into line regardless of the amount of change needed. One should bear in mind, however, that it takes time to learn to sail a new yacht to its full potential; ratings of new yachts should remain provisional until the committee is satisfied.

Despite the fact that base ratings should not be averaged across many fleets, the concept of a "PHRF mean" does have its use for general guidance. This comes in an annual review, when it is wise to check the ratings of all yacht types, particularly those for which few or no race results have been forthcoming. These inactive yacht types may have been very active in other fleets, and their ratings should be kept in line with the trend.

4.4 THE SKIPPER EFFECT

A major problem in all performance handicapping is separating differences due to the true speed potential of yacht designs from those resulting from the skill of skippers and crews. When a fleet has only one or two yachts of a particular type, judgement becomes especially difficult.

We can gain a good idea of the size of the skipper effect from typical results of one-design races. Analyses reported by US-PHRF suggest that the average results of a 10-yacht race are distributed as shown in the following diagram, the winner sailing about 15 sec/mile faster than middle finishers, the last yacht similarly slower. If the class includes a champion of national status, he can be expected to sail about 25 sec/mile faster than middle finishers.

These figures vary with the number of starters. With 5 yachts a difference of 10 sec/mile, and with 15 yachts 20 sec/mile, would be typical for the winner. The extra skill of a champion is likely to show less change; he will sail more consistently 10-15 sec/mile faster than the typical club winner.

We should expect to see variations like these among yachts properly handicapped for speed potential. If we try to "straighten the line", as application of a constant threshold would do, we will be handicapping winning skippers unduly and giving the rear-guard an unwarranted boost. (The latter may not be a bad idea - until the skipper imports a crew of experts for the next major regatta.)

In effect, the chosen threshold should be superimposed on the curved line in the diagram, not the horizontal line. Clearly, these numbers are only representative; particular race conditions can produce wide variations in the skipper effect. No simple rule can be suggested, but Handicap Committees should guard against rating revisions that would compress corrected times more closely than the spread of times to be expected in one-design racing.

4.5 PROVISIONAL RATINGS

When assigning an initial rating to a type of yacht new to the fleet, the obvious first step is to see whether any other fleet (in the whole of US-PHRF) has rated that type, paying due regard to relevant differences between that fleet's ratings and your own.

If no entry can be found, similar designs of yachts with known ratings should be sought, preferably at least one expected to be slightly faster and one slightly slower, from inspection of their characteristics. Judicious interpolation can then be made, based primarily on comparison of lengths, sail areas and displacements.

For this comparison, the formula suggested in Section 6.6 may be useful, although it estimates the ratio of time correction factors, NOT time allowances in sec/mile.

Whatever method is used, the initial rating should be clearly identified as "provisional", to be reviewed as soon as race results provide significant evidence. As already noted, the rating should remain provisional until the committee is satisfied that the yacht has reached its potential. This may be for a full season, or even longer if the yacht races infrequently.

Some fleet rules specify that yachts with provisional ratings are not eligible for prizes. That may be good self-protection, but is questionably the proper business of a handicapping organization. It is better to leave such decisions to Race Committees, while clearly reminding them to state their policy regarding provisional ratings in Notices of Race, under IYRU Rule 2 (c).

4.6 RATING APPEALS

Policy regarding rating appeals varies all the way from fleets with no set procedure to fleets that operate by appeals, meeting only when a rating is challenged. We do not advocate the latter.

A fleet should first decide who has the right to appeal; only the yacht in question or yachts competing against her? Should the appellant come directly to the Handicap Committee, or should the case be made through the club representative? In most situations, he will have better knowledge of the local scene than committee members, and better knowledge of the committee than the appellant. However, the possibility of shortcomings in the work of a club representative also has to be borne in mind.

Two steps are suggested. Anyone should be able to discuss a case with their club handicapper, and if he agrees, he submits it to the Handicap Committee as part of its regular business. If he disagrees, he should nevertheless be obliged to forward to the Handicap Committee any case that he receives IN WRITING.

This is important, because homework will be needed to arrive at a fair conclusion, and the appellant should be warned that a decision may not be reached at the first meeting. Unlike most protest hearings, opposing views will not be confined to a single adversary, and personal appearance will rarely be constructive to either the committee or the appellant.

In the rare case of a club representative failing to do his job, the first approach should be to club management; this is an internal club problem. The Handicap Committee should only accept cases by-passing the club representative if specifically asked to do so by the management committee of that club.

Challenges to rating facts, as opposed to rating assignments, should be handled by protests under IYRU Rule 19. For example, if a yacht is suspected of sailing with a headsail larger than she has declared, another competitor should protest. Presumably, the Race or Protest Committee would immediately call for the sail to be measured. The facts found in such protests should be reported to the Handicap Committee, but it is seldom otherwise involved.

4.7 SAIL MEASUREMENT

In this honour system, a common grumble is that a skipper has no idea of the size of his sails. (Other peoples' sails always look larger than yours.) In most fleets, measurement is only required as a result of a protest, but voluntary measurement can sometimes prevent potential arguments and is simple to do.

An official measurer is not needed and an accuracy of an inch will suffice. The following notes cover likely rig measurements.

"LP" is measured only for the largest headsail. With this sail spread out on the ground, clamp or have a helper hold the end of the measurimg tape at the clew so that zero lies where the lines of leech and foot would intersect, if extended. Take measurements to several points along the luff, seeking the minimum, which will be the perpendicular. Include the width of a luff tape.

"SMW" and "SL" are measured for the largest spinnaker. The spread sail is folded in half along its vertical centre seam, so that the two luffs lie on top of each other. Measure across the sail at several places near mid-height, guided by horizontal seams, seeking the maximum half-width (and don't forget to double). Then measure the overall length along the luffs for "SL".

"SPL" is simply the overall length of the spinnaker pole, not measured inside the jaws.

"J" is measured from the forward side of the mast to the deck attachment point of the jibstay, horizontally. If there is a high cabin house, it may be necessary to hold a carpenter's level or plumb bob at the bow to get a reasonably level measurement.

"I" is best measured by clipping the end of the tape to the spinnaker halyard and hoisting as far as it will go. Measure to the deck level at the sheerline abeam of the mast. This diagonal path will compensate, closely enough, for the missed length of the snap-shackle and halyard block. There is no need to go aloft.

"P" is similarly measured on the main halyard, hoisting to the black band if there is one, all the way if not. Measure to the top of the boom at the gooseneck.

"E" is measured along the boom, from the aft side of the mast to the black band or clew-outhaul fitting if there is no band.

Do not try to measure "P" or "E" on a mainsail spread out on the ground. You will be unable to stretch either the luff or the foot enough to obtain true readings.

4.8 WINTER DISCUSSIONS

To promote interest in the goals and methods of performance handicapping, it is useful to arrange periodic discussion meetings, open to all sailors, perhaps over the winter season. Participants should be encouraged to ask questions and make comments on any aspect of the handicapping process, except the particular ratings of individual yachts. Many of the guidelines noted in this manual have their origins in ideas expressed at such meetings.

CHAPTER FIVE

N.S.Y.A. FLEET PROCEDURES

5.1 INTRODUCTION

The Nova Scotia Yachting Association operates a performance handicap racing fleet, with a difference. The fleet predates the PHRF concept, and while it is now a member fleet of US-PHRF, and follows all the principles described in Chapter 2, the NSYA fleet publishes its ratings as ATLANTIC SPEED POTENTIAL NUMBERS or ASPNs, which are directly proportional to potential speed. This leads to easy use of time-on-time correction, favoured by NSYA Clubs, while the ratings can be converted to PHRF time allowances, as described in Section 7.5.*

Still known locally as the ASPN System, the fleet's objective is:

"To enable yachts of all types to participate in open regattas among the Clubs of the NSYA, under conditions which approximate those of one-design racing, in order to provide enjoyable racing".

There are several important principles embodied in this definition:

(1) The system is intended for inter-club regattas. There is no implied wish to impose the ASPN system on any Club for its own internal racing.

(2) By seeking only to "approximate" conditions, we openly acknowledge the impossibility of doing an exact job.

(3) A one-design regatta usually caters to several classes. In the same way, a handicap regatta should be divided into classes, each having a limited spread of ASPNs.

(4) In one-design racing, yachts are of the same design but the quality of their sails and gear may differ, and the ability of skippers and crews varies widely. The ASPN system similarly seeks to equalize the potential performance of yacht designs, not individual performance of each yacht and her crew.

(5) We are concerned with fun and enjoyment, not crowning champions.

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* For now, simply be aware that 1 ASPN point has similar effect to 4-6 sec/mile, over the range of interest.

5.2 BASIS OF THE SYSTEM

The Atlantic Speed Potential Number is simply an estimate of the potential speed of a yacht, expressed as a percentage of the speed of a fictitious "standard yacht". Thus the standard yacht has an ASPN of 100, and no correction is made to her elapsed time.

A yacht assigned an ASPN of 95 has been judged to have a potential speed only 95% that of the standard yacht. This slower yacht is expected to take longer to sail the course, so her elapsed time is shortened, by the correction factor 95/100.

Similarly, a faster yacht with an ASPN of 110 has her actual time lengthened, her corrected time being 110/100 times her elapsed time. Thus the ASPN system is very simple to apply, particularly with a calculator that multiplies in hours,minutes and seconds. The time correction factor is simply ASPN/100.

The essential basis of the ASPN system is constant observation and analysis of race performance under local conditions, following the principles described in Chapter 2. Because the aim is to find potential speed differences between yacht designs, when sailed at their best, the ASPN is established from race results of the best performing yacht of a particular design.

The analysis of race performance and the consequent assignment of ASPNs is the responsibility of Club appointed Handicappers, who collectively constitute the NSYA Handicap Committee, together with an independent Chairman. The Chairman is a Director of the NSYA, and is elected at the NSYA's Annual General Meeting.

The system depends on the quality of the data generated by the individual Club Handicappers, who in turn rely on the help of their Race Officers in determining those race results that are valid for analysis. It is essentially an honour system, in which yacht owners also share the responsibility and credit for its development.

5.3 INVENTORY ADJUSTMENTS

The ratings published in the N.S.Y.A. YACHT LIST, usually six times a season, apply to yachts with the standard configuration defined in Section 2.4, and having an inboard engine unless the type is listed as outboard (OB). The following adjustments are now used, but the Handicap Committee may change these at any time. The current list appears on page 1 of each N.S.Y.A. YACHT LIST.

An owner will declare his sail inventory by submitting a YACHT DATA SHEET to the NSYA. He may not change this declaration more than twice during a season, and never during a regatta or race week. If no declaration has been made, the yacht is assumed to have a headsail over 170%J and a spinnaker over 200%J. The corresponding maximum penalties do much to hasten owners' declarations.

LARGEST HEADSAIL	Oversized headsail, over 170% J - +2 points Oversized headsail, up to 170% J - +1 point Standard headsail, up to 150% J - 0 Undersized headsail, up to 135% J - -1 point Working jib only, up to 120% J - -2 points
LARGEST SPINNAKER	Oversized spinnaker, over 200% J - +2 points Oversized spinnaker, up to 200% J - +1 point Standard spinnaker, up to 180% J - 0 Poleless cruising spinnaker only - -1 point No spinnaker (fractional rig) - -2 points No spinnaker (mast-head rig) - -3 points If SL > $0.95\sqrt{(I^2 + J^2)}$ a special penalty will apply; +2 points for each 5% excess, or part thereof.
ENGINE & PROPELLER	Inboard engine in an OB class - -1 point Fixed three-bladed propeller - -1 point

An exception to this requirement is made at the first regatta entered by a newly active yacht, and always for yachts visiting NSYA Clubs. Here, the owner's declaration will be accepted on the regatta Entry Form.

The Handicap Committee publishes no fixed tolerances on dimensions, but will apply discretion. Thus an old 150% genoa that has stretched is unlikely to be penalized. The Committee will also determine borderline cases of fractional or mast-head rigs. All other non-standard features will be assessed individually.

Any loopholes found in the system will also be plugged to preserve the intent of fair handicapping. Skippers are encouraged to protest suspected violations under IYRU Rule 19. Findings of the Club Protest Committee will be valid for that regatta, and will be reviewed by the Handicap Committee for any required change of ASPN.

5.4 APPLICATION TO CLUB RACING

In any speed potential system, the best maintained, best tuned, and best sailed yachts should win, as is the case in one-design racing. This is the only fair way to establish a system for use in open regattas, involving many different Yacht Clubs.

However, we recognize that, to encourage novices, or those who cannot afford new sails as frequently as others, Clubs may wish to organize some internal racing based on personal performance rather than potential performance. Clubs may not want the best man to win all the time. The NSYA has no desire to impose its published ASPNs on Clubs for their own internal use.

On the other hand, the ASPN does provide a sound base on which Club Handicappers can build their own adjustments for individual performance. They can simply adjust for personal performance in the same way that the Handicap Committee does for class performance, as described later. To avoid confusion, Clubs are encouraged to call such adjusted number ISPNs, for Individual or Internal use.

Of course, when a yacht with such a handicap enters an open regatta, it will sail under its ASPN assigned by the Handicap Committee. In large regattas, there are other ways of encouraging novices (see Section 6.5); the principle that the best man should win ought to hold at all major events.

5.5 CALCULATING RACE RESULTS

NSYA Clubs are encouraged to use the RACE RECORD SHEET shown on the next page. This is more complete for handicap racing than the CYA sheet, including columns for class of yacht (C&C 30,etc.), ASPN, and ESPN (explained below).

As already discussed, the corrected times are calculated by multiplying the elapsed times by ASPN/100. The additional step of analyzing the results is almost as simple.

First, we need to pick out the "median corrected time". This is the corrected time of the yacht finishing in the middle of the fleet, when ordered by corrected times. With an even number of finishers, we pick the first of the two middle finishers. For example, in races with 9 or 10 finishers, the yacht finishing 5th on corrected time would have the median corrected time.

The median corrected time is then divided by the elapsed time of each yacht, and multiplied by 100, to calculate the "Effective Speed Potential Number" (ESPN) of each yacht. The ESPN is the ASPN each yacht would need to have, for all yachts to finish that race with the same (median) corrected time.*

The leaders will have ESPNs larger than their ASPNs and the stragglers will have ESPNs smaller than ASPNs, the differences being a measure of their performance in that race. It is these ESPNs which are brought to meetings of the Handicap Committee for discussion of performance trends over several races.

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* Old hands will note that using the MEDIAN instead of the MEAN corrected time eliminates a step in the calculation. More significantly, it avoids the need for judgement in deciding which stragglers to discard when calculating the mean. Experience has shown that the median produces more consistent ESPNs.

NOVA SCOTIA YACHTING ASSOCIATION
Official Race Record Sheet

Club:	Course Length (N.M.):
Date:	Wind Dir./Vel. (KTS):
Series:	No. of Starters:
Race: Course †:	Median Corrected Time *:
Start Time:	Race Officer:

Corrected Time = Elapsed Time x $\frac{\text{ASPN}}{100}$

ESPN = $\frac{\text{Median Corrected Time}}{\text{Elapsed Time}}$ x100

SAIL NUMBER	NAME OF YACHT	CLASS OF YACHT	ASPN	FINISH TIME (h. m. s.)	FIN. ORD.	ELAPSED TIME (h. m. s.)	CORRECTED TIME (h. m. s.)	COR. ORD.	NOTES	ESPN

* Corrected time of the middle finishing yacht, or the first of two middle yachts (e.g. 5th among 9 or 10 finishers).

† If not listed on course card, please provide sketch on back of sheet.

5.6 N.S.Y.A. HANDICAP COMMITTEE

Because of the need for judgement in deciding which race results are valid for handicap assessment, the active and regular participation of individual Clubs is most important. Formally, each Club is represented by one member on the Handicap Committee, but Clubs are asked to name alternative members. Both the Handicappers and their deputies are encouraged to attend all meetings so that continuity of Club participation is assured.

Most Committee discussions eventually reach a consensus but if a vote is needed, each Club has one and the Chairman may cast a deciding vote. The NSYA Executive Director acts as secretary of the Committee, her attendance facilitating the prompt distribution of the revised lists of ASPNs which result from each meeting.

At the first meeting of each year, normally held in April, a firm schedule of meeting dates is agreed, so that Clubs can plan their attendance well in advance. Meeting dates are chosen to fall between the dates of important open regattas. Sufficient racing must have occurred since the previous meeting, and up-to-date ASPN lists must be available for the major events. These criteria call for a usual total of six meetings; the first concerned mainly with new yachts, four mid-season reviews and a final annual review.

To encourage attendance by Clubs outside the Halifax-Dartmouth area, the NSYA is prepared to cover travel expenses for Clubs more than 25 km away from the Club hosting a meeting. AYC, BBYC, DYC, RNSYS and SYC are regular hosts, and one meeting a year is usually held at a South Shore Club.

5.7 A.S.P.N. REVISION

Club Handicappers bring to meetings ESPNs calculated for all valid races held since the previous meeting. When a significant difference between ESPN and ASPN is consistently maintained over several races by the best performing yacht of a class, an ASPN revision is discussed for that class (or type of yacht).

A "significant difference" is usually taken to be 2 points averaged over at least 3 races, and after making allowance for the skipper effect, following the guidelines described in Section 4.4. For interpreting Section 4.4, we take 1 point = 5 sec/mile. Thus, for example, a consistent winner of 10-starter races would only be considered for revision if her ESPN averages 2+3 = 5 points above her ASPN or more. There is no firm rule, however, and yachts which just miss the threshold of "significant difference" are marked for close scrutiny at the next meeting.

When averaging ESPNs over 3 races, say, the mean can be unduly biased by a single extraordinary result. Such results should be excluded from the average and discussed separately; they probably result from some chance event. Only the yacht with the highest ESPN in a particular class need be considered; it is the best performing yacht that establishes the speed potential of the design.

An inevitable shortcoming of performance handicapping is the implicit assumption that the best performing yachts in each class have reached a comparable level of tuning and skill. Obviously this is not true, particularly when there is only one yacht in a class, which may well be owned by a novice. Despite allowances for the skipper effect and other judgement based on knowledge of the people and yachts involved, a tendency to favour the inexperienced owner of a one-off yacht will remain. This is, however, in the right direction for encouraging fun and enjoyment.

An alphabetical N.S.Y.A.YACHT LIST is not the best listing for considering ASPN revisions. We need to see what effect a change may have on other classes with similar speed potential. The display shown on the next page, with classes displayed vertically in order of ascending ASPN, and with groups of yachts of similar kind shown horizontally, enables the Committee to identify the impact better. All-out racers are to the left; cruisers to the right. Designers might challenge our choice of intermediate groups but it serves its purpose to direct priorities, first to the "block" in question, then to the adjacent blocks.

Only in exceptional circumstances will a revision of more than one point be decided on the basis of one set of race results. If it is, the evidence supporting this special revision is recorded in the minutes. Reasons for

revisions of one point are minuted only if the evidence comes from a source other than local race results, or if that revision takes the class more than 3 points away from the PHRF mean curve (See Section 7.5).

This caution against movements larger than one point may cause temporary frustration. However, experience shows this to be less disruptive than the oscillations that can result from reacting too precisely to short-term trends.

There are two exceptions to the normal practice. One applies to "provisional" or "inactive" ASPNs, discussed in Section 5.8. However, the Committee may also impose abnormal revisions on any yacht showing evidence of deliberate slow sailing or any other unsportsmanlike practice. An increase of several points can take a long time to reduce, one point at a time.

The use of half-points is often suggested and was tried for a few years. In truth, this is a higher level of accuracy than the method can justify. Moreover, the quality of decision-making at Committee meetings suffered, too much time being spent on irresolvable arguments over half-point revisions, and not enough on the really deserving cases. As it is, the Committee normally faces a straight-forward yes or no decision, to change by one or to leave alone, and can concentrate on the merits of the evidence.

If a Club Handicapper happens to be the owner of a yacht in a class being discussed by the Committee, he excludes himself from that discussion, unless asked for specific evidence by the Chairman.

PRINCIPAL RACING CLASSES

ASPNs from NSYA Yacht List 92/6

96 97 98 99 100			WW IND-20 PY-23 CAT-25 TAN-22	CON-26 TAN-7.5
101 102 103 104 105		EXP-20 SHARK NS-500 BLUENOSE BLUEJAY P-23 PAR-23 CC-25-2	CC-24 MIR-24 JEN-25 CC-26 BEN-24 MIR-27-1 CAT-27 MIR-26 MIR-27-2 T-BIRD CC-25-1 MIR-25 CC-27-1	 NON-26 ALO-8.2 NW-29 P-29 AC-Y-30
106 107 108 109 110		GK-24 NS-727	TAN-26 PY-26 CC-27-2 VIK-28 BEN-28.5	CLAS-31 DOUG-32 NON-30 CON-32
111 112 113 114 115	J-22 K-25 ROUE-20 BOM-7.6 SONAR SOLING	TAN-25 NIA-26 CC-27-3 CC-29-2 MIR-29 MIR-30 TAN-29 CHAS-29 ALO-30	 CC-29-1 ODYS-30 JEN-32 CC-30-1 CC-32 BEN-305	ONT-32 RIV-34 NIA-35 NS-1500 NS-38 NON-36
116 117 118 119 120	J-24 STAR LAS-28 J-30	CC-30-2 CS-30 MEGA EXP-3OM	SIG-33 MIR-33 JEN-34 VIK-33 CC-34 BEN-325 CC-33-1 CC-36 CS-36 CC-35-1 CC-35-2	 MIR-35 CHES-C
121 122 123 124 125	K-30 J-27 E-22	CC-33-2 CC-35-3 FAR-38 CC-37-1	 JEN-40 BEN-375	
126 127 128 129 130	J-29 DAS-34 ABB-36 PET-37 BEN-10	CC-38-1 CC-38-2 CC-38-3 BEN-405 CC-40-2 CC-42 CS-40 JEN-39		
131 132 133 134 135	CC-41 CC-37-2 CC-41-GP J-35	CC-46 K-40		
136 137 138 139 140	CC-37-R PET-44 (KAU-47 at 143) TRP-41 (BAL-64 at 159)			

5.8 PROVISIONAL AND INACTIVE A.S.P.N.s

When a new class of yacht is first assigned an ASPN by the Committee, that rating is designated "provisional" and marked (P) in the standard list. This indicates that the Committee has not yet established the performance of that class relative to other classes in the fleet, and serves warning that the number may be inaccurate.

Since any Race Committee has the right to refuse entry to any yacht under IYRU Rule 1.6, it may be superfluous to point out that a Club need not accept yachts with provisional ASPNs for open regattas. The Handicap Committee would prefer to see Clubs accept them, unless a prestigious trophy is at stake, simply because regattas afford the best opportunity for good performance data. What is important, however, is that each Club determines what its policy will be, and publishes a clear statement in the Notice of Race, under IYRU Rule 2(c). A similar policy statement should be made regarding yachts not registered in the ASPN system.

The normal practice of limiting revisions to one point at a time does not apply to provisional ASPNs. The Committee simply does its best to bring the rating in line whenever race results become available, and the "provisional" notation is not removed until the Committee is satisfied with the extent of the data on which the ASPN is based.

At the last meeting of each year, classes that sailed fewer than three races during the season are transferred to an "inactive" list. All inactive ASPNs are checked against PHRF data, and any class rated more than 2 points away from the PHRF mean curve are either revised or the reason for not doing so is minuted, to explain the discrepancy.

Inactive ASPNs are treated the same way as provisional ASPNs. When the Committee learns that an inactive yacht has started to race regularly, its ASPN will be transferred to the active column as provisional, to be reviewed as soon as results become available.

5.9 N.S.Y.A. HANDICAP LISTS

All revisions made by the Committee are incorporated in the N.S.Y.A. YACHT LIST. A new list is issued to all Clubs, bearing the date of each Committee meeting. These effective dates may seem unfair to some distant Clubs, but the majority of users have the information by attending the meetings, and the revised ASPNs may be needed for an imminent local regatta.

Classes are listed alphabetically, with their assigned standard ASPNs, and within each class, all yachts which have a YACHT DATA SHEET on file are listed alphabetically by name, showing the adjustments for inventory as well as the class ASPN, and hence the actual ASPN of each yacht. Essentially, an entry in the N.S.Y.A. YACHT LIST is the equivalent of having a PHRF certificate. No individual certificates are issued to yacht owners.

A "CHANGE" column is included, indicating a yacht's status as follows:

1st- One change of inventory has been made this season.
2nd- Two changes of inventory have been made this season.

All classes changed from the previous list are marked with an asterisk. Provisional and Inactive ASPNs are identified by "P" and "I" respectively, and a final page lists inactive classes in which no yachts are currently registered.

5.10 RATING APPEAL PROCEDURES

If a yacht owner feels that the Handicap Committee has acted contrary to these guidelines in revising his ASPN, the first step is to seek clarification from the Club Handicapper. He has the best knowledge of both the Committee and the yacht in question, and the revision will probably have resulted from race results presented by that handicapper. Most owners require only a sound explanation of the decision; they may not like it, but if they understand it, they will be satisfied.

If some error is found in the data, or other facts emerge that cause the Club Handicapper to agree that reappraisal is warranted, he will bring the case back to the Committee as part of its normal business. In the case of an obvious mistake that could not be challenged by the Committee, such as a wrongly identified yacht or clerical error in the published lists, the Chairman can authorize immediate correction when so requested by the Club Handicapper.

If the yacht owner and Club Handicapper cannot agree, and the owner seeks to appeal, he should submit a case IN WRITING, addressed to his Club Handicapper for the attention of the Handicap Committee. Correspondence addressed to the Chairman or NSYA Office, not forwarded via a Club Handicapper, will be returned.

Owners should bear in mind that the principles and guidelines in this manual cannot be appealed, only their interpretation and application. Any complaint regarding the effectiveness of a Club Handicapper is an internal Club matter; the approach should be to Club Management, not to the Handicap Committee.

The Committee will require time to study an appeal and may not be able to render a decision at the first meeting following its receipt. Oral presentations are not accepted.

CHAPTER SIX

GUIDELINES FOR RACE COMMITTEES

6.1 INTRODUCTION

This chapter is a collection of miscellaneous notes considered useful to Race Committees in planning and conducting regattas with handicap racing. They are guidelines used by the NSYA, and details are specific to the ASPN system. However, the principles apply to all handicapping methods, and should be of more general interest.

6.2 HANDICAP CLASSES

In deciding how best to divide a handicap fleet into classes for a regatta, consideration should be given both to potential speed and to seaworthiness. For example, the NSYA recognizes three classes depending on safety standards.

Class I yachts are those that meet the Offshore Racing Council's "Special Regulations Governing Offshore Racing", for category 3 races, with certain amendments detailed in the NSYA Sailing Instruction Guide. Essentially, this defines those yachts suitable for round-the-buoy racing in open coastal waters. Extended races of the Bluenose Offshore Racing Circuit demand the additional standards of ORC category 2 races. (See IYRU Rules, Appendix 16.)

Class II yachts are keel-boats not meeting Class I standards.

Class III yachts are small centreboard boats and catamarans.

Both of these classes are required only to meet the Canadian Coast Guard safety regulations. It is expected that Race Committees will arrange courses in sheltered waters and provide rescue facilities appropriate to these classes.

Such classification based on seaworthiness is fundamental, but it is also desirable to break the total spread of potential speeds into ranges over which handicapping can hope to achieve reasonable correction. Clearly, the extent to which this can be done depends on the number of entries.

Most yachts racing under the ASPN system fall into the range of 94 to 125. For small regattas, the recommended class division breaks this into even intervals;

Class A: ASPN of 109 and above.
Class B: ASPN of 108 and below.

If a significant number of boats appear with ASPN's below 94, they should be raced as a separate class.

For large regattas, a further split is advocated, defining;

Class A1: ASPN of 114 and above.
Class A2: ASPN of 105 to 113.
Class B1: ASPN of 94 to 104.

These boundaries are suggested only as guidelines. It is expected that Race Committees will review the number of yachts registering for each class, and they may change the boundaries to obtain a better split of starters.

Clubs should decide whether safety factors or speed are going to govern their choice of classes in a regatta, and make this clear in the Notice of Race by using the proper designations. It is sensible to combine these. For example, one might have a series of inside races suitable for all yachts, plus an outside race on a long course suitable only for the faster yachts. These might be described as follows:

Class A race open to Class I yachts only (outside course)
Class A race open to Class I & II yachts (inside course)
Class B race open to Class I & II yachts
Class A,B combined open to Class III yachts

There exist a few heavier yachts with ASPNs under 109 or 114, which are clearly better suited to the length and type of courses normally set for Class A or A1. There is also a group of lighter boats with ASPNs over 108, differing from the typical Class A yacht. Such designs as J-24 and Kirby 25 should be given a separate race if their numbers so warrant.

6.3 REGATTA REGISTRATION PROCEDURE

Race Officers are asked to check the registrant's Entry Form with the N.S.Y.A. YACHT LIST. If the yacht is listed as 1st or 2nd status and inventory agrees with that declared on the Entry Form, all is well, and the listed "Actual ASPN" can be used.

If the Entry Form shows a change of inventory, and the yacht's status is 1st, ask the owner to complete a new YACHT DATA SHEET before racing. If he does not do this, or if the status is 2nd, tell him that no change can be made, use the listed "Actual ASPN" and correct the Entry Form.

If the yacht is not listed in the N.S.Y.A. YACHT LIST, ask the owner to complete a YACHT DATA SHEET before racing. If he does not do this, apply the maximum penalties for oversized headsail and spinnaker (unless it is a yacht visiting Nova Scotia or a new yacht registering for its first regatta).

After the regatta, Race Officers should forward YACHT DATA SHEETS to the NSYA immediately, so that the lists can be updated.

6.4 GUIDANCE FOR CENTREBOARD BOATS

In major open regattas, handicap racing for small centreboard boats should be discouraged. The wide differences between various classes in their ability to plane makes it impossible to devise a fair handicapping system for these boats. The problem becomes acute if catamarans are included.

For this reason, the NSYA does not publish official ASPNs for Class III yachts, and encourages Race Committees to organize one-design racing only, to foster the development of fleets of the more popular classes.

However, Race Committees may find it difficult to turn down eager young owners seeking to register a miscellany of small craft at an open regatta. If faced with this situation, it is certainly preferable to have a Class III handicap race than to attempt to mix centreboard boats with keel-boats.

For guidance only, the following is a list of suggested handicaps, believed to be as consistent as possible with the ASPN system. They are better than nothing for a "fun" race, but any boat sailing under these guidance numbers should certainly not be considered eligible for a prestigious trophy, and all competitors should be duly warned of the limitations in attempting to handicap Class III boats.

Albacore	90	International 14 Ft	115
Bombardier 3.8	96	Invitation	98
Cadet	75	Laser	101
CL-16	97	Laser M	95
Code 40	96	Laser II	107
Finn	103	Lightning	104
Fireball	108	Mirror	80
Five-0-Five	115	Optomist	70
Fleetwind	85	P - 17	96
Flying Dutchman	118	Prindle 16	125
Flying Junior	92	Snipe	97
Flying Junior(Ind)	86	Sunfish	86
Four-Seventy	109	Tasar	108
Four-Twenty	98	Topper	82
Hobie 14	116	Wayfarer	97
Hobie 16	125	Windsurfer	92

NSYA cannot guarantee to update this list regularly, since it does not receive enough data on the relative performance of centreboard classes.

6.5 ENCOURAGING NEWCOMERS

The best man should win at open regattas; encouraging novices by using handicaps based on individual performance falls within the sphere of internal Club racing. There are, however, other ways to encourage newcomers to participate in open regattas, which Race Committees should consider when planning events.

In recent years, the addition of a "Cruiser Class" race has met with some success. This is open to all keel-boats, but they are not allowed to set spinnakers (or any other extra sail). This allows the man and wife, or small family, to race their cruiser without being at great disadvantage compared with a fully-crewed yacht. There is more to the idea than eliminating the physical effort of handling a spinnaker. Would-be participants in the cruiser class know that they are unlikely to be sailing against the hot-shots and rule wizards, and they are psychologically more at ease and inclined to have a go. The Notice of Race should advertise this class as being for the family crew.

Some less experienced sailors, who may race happily in a Club evening series, will not enter an open regatta because they are apprehensive of the larger numbers of yachts milling about before the start. A race with a Bermuda start will often encourage such newcomers to appear, simply because this sort of start is docile.

Race Committees should also be aware of a more accurate modification of this type of race. In this, the start is made Bermuda style, but finishing times are also recorded. Thus the true elapsed times can be obtained and corrected times calculated as in a normal race.

For yachtsmen thinking of going to a regatta at a strange Club, it would be very encouraging to have a booklet describing the facilities available. This should include a sketch showing where to come alongside to register, where fuel and water can be found, where anchoring is advised, and notes on whether marinas or moorings are available for visitors, tender service, meals available, bar hours, etc.

6.6 TEMPORARY HANDICAP ESTIMATES

As mentioned earlier, Race Committees should decide well in advance, and publish in all Notices of Race, what their policy will be for yachts registering with only a "provisional" handicap.

A more difficult problem the registrar may face is a newly appearing yacht that has yet to be assigned even a provisional handicap. This case should similarly be covered in the published policy statement.

In assigning a provisional ASPN, the Handicap Committee takes into account all the data it can obtain; PHRF, IMS, IOR or LOR ratings, Portsmouth Numbers, and its own analysis. It is clearly impractical for a Race Committee to do this in the heat of registration.

Based on such data, a comparison formula has been developed which should give a number close enough to allow the new yacht to have fun. It is up to the Race Committee to decide whether to allow such a yacht to be eligible for prizes, and it must clearly be explained to the owner that his number is valid only for that one regatta. Ask the owner to complete a YACHT DATA SHEET so that the preliminary work can be done to propose a provisional ASPN at the next meeting of the Handicap Committee.

The formula requires a knowledge of the overall length (L_1), displacement (W_1) and sail area (S_1) of the yacht in question, and the same information (L_2, W_2, S_2) for another yacht of comparable length and type, for which the ASPN is known ($ASPN_2$). Then,

$$ASPN_1 = ASPN_2 \sqrt{[(L_1/L_2)\sqrt{(S_1/S_2)}\ {}_3\sqrt{(W_2/W_1)}]}$$

This works with any time correction factor, but not with a time allowance. It is best to use the sail area of mainsail plus fore-triangle, in terms of the IOR dimensions, $S = (PxE/2) + (IxJ/2)$, but the important point is to use corresponding areas for both yachts.

6.7 SIZE OF CREW

The NSYA has no desire to limit the number of crew sailing on any yacht. However, Race Committees of prestigious events should be aware that the ASPNs in this list have been derived from the results of races sailed with normal crews. They may wish to control the possibility of a yacht gaining unfair stability by embarking abnormal "movable ballast". For their guidance only, when writing an appropriate Sailing Instruction, the following table suggests the maximum crew size considered applicable to these ASPNs, based on 160 lb adults.

L.O.A. (Feet)	Max. Crew	L.O.A. (Feet)	Max. Crew
Below 20	4	38,39	11
20,21,22	5	40,41	12
23,24,25	6	42,43	13
26,27,28	7	44,45	14
29,30,31	8	46,47	15
32,33,34	9	48,49	16
35,36,37	10	50 & up	17

CHAPTER SEVEN

CORRELATION OF HANDICAPPING SYSTEMS

7.1 INTRODUCTION

This chapter describes the principles involved in converting handicaps from one system to another. First we have to understand the difference between time correction factors (TCF) and time allowances (TA). We shall see that the TCF is fundamentally the simpler measure, directly proportional to the speed of the yacht, non-dimensional, and independent of course length.

For this reason, having found how to convert a TA into a TCF, we present comparable TCF values for popular handicapping systems, thus facilitating direct comparison of results. Thinking of TCF as a speed, the speed of the "scratch" yacht is TCF = 1.0, and because the various systems use different scratch yachts, they need to be "shifted" to bring them to a common reference.

The accuracy of these comparisons depends on the extent of the data available for a given system. The writer has a good data base for PHRF and ASPN systems, but barely adequate data for the others. Readers most interested in other systems will have better data, so the emphasis here is on methods, not results.

However, the sound PHRF - ASPN correlation, established and refined over many years, can be recommended to PHRF fleets seeking to experiment with time-on-time correction. For this purpose, a table for converting PHRF time allowances into time correction factors is presented.

7.2 BASIC PRINCIPLES

Suppose a yacht sails D nautical miles in T hours, whereas the scratch yacht sails the same distance in T_0 hours. The objective of handicapping is to change the elapsed time T to a corrected time T_C, where $T_C = T_0$, assuming that the yachts are sailed equally well. We can do this in two ways:

(1) By time-on-time correction, putting $T_C = T(TCF)$, where TCF is the time correction factor, or

(2) By time-on-distance correction, putting $T_C = T - (TA)D$, where TA is the time allowance in hours per mile.

Notice that the average speed of the yacht, $V = D/T$ knots, and that of the scratch yacht, $V_0 = D/T_0$ knots, are related directly by the TCF. Since $T_0 = T_C = T(TCF)$, then $V_0 = D/T(TCF) = V/(TCF)$. Thus,

$$TCF = V/V_0 \quad \text{and similarly,}$$

$$TA = 1/V - 1/V_0 \quad \text{hours/mile.}$$

To obtain the same corrected time by both methods, we would need to have

$$T(TCF) = T - (TA)D \text{ , or } \qquad TCF = 1 - (TA)D/T \tag{1}$$

which involves $D/T = V$, the average speed of the yacht. Hence we see that the same result will only be obtained for one particular speed of race.

Originators of the NAYRU (and other) Time Allowance Tables worked in terms of a standard inverse speed, or average time per mile, which they expressed in the form,

$$T/D = A(1/\sqrt{R} + B) \text{ hours/mile} \tag{2}$$

where R is the rated length of the yacht. They knew that the potential hull speed depended on the square root of length and evaluated the constants A and B from empirical analyses of race results in average conditions, stated to be 10 knots of wind and calm water.

Assuming this form of relation between speed and rating, in feet, the time allowance is simply,

$$TA = A/\sqrt{R} - A/\sqrt{R_0} \text{ hours/mile} \tag{3}$$

where R_0 is the rating of the scratch yacht. The terms involving B cancel out. Specifically, the NAYRU or "Sixty Percent" tables are based on the formula, $TA = 0.6/\sqrt{R} - 0.6/\sqrt{R_0}$ hours/mile or, using the standard scratch rating of 100 feet, and sec/mile,

$$TA = 2160/\sqrt{R} - 216 \text{ sec/mile .}$$

To find the time correction factor in a similar form, we put equations (2) and (3) in (1) to obtain, after simplifying,

$$TCF = \frac{1/\sqrt{R_0} + B}{1/\sqrt{R} + B} \tag{4}$$

In this case, the terms involving A cancel out, but if we know A and B for any handicapping system, equations (3) and (4) allow us to convert between time-on-distance and time-on-time correction. Remember, however, that the values of A and B will have assumed an average speed of race.

7.3 APPLICATION TO POPULAR SYSTEMS

7.3.1 International Offshore Rule and Lake Ontario Rule

Both of these systems use the NAYRU Time Allowance Tables, for which A = 0.6 and B = 0.085 in equation (2), with a scratch rating of 100 feet. From (3) and (4) then, we have,

$$TA = 0.6/\sqrt{R} - 0.06 \text{ hours/mile}$$

$$TCF = 0.185 / (1/\sqrt{R} + 0.085)$$

7.3.2 Midget Ocean Racing Club

The corresponding values for MORC, based on 1980 revisions, are A = 0.65, B = 0.098 and R_0 = 35 feet, so that,

$$TA = 0.65/\sqrt{R} - 0.11 \text{ hours/mile}$$

$$TCF = 0.267 / (1/\sqrt{R} + 0.098)$$

7.3.3 Performance Handicap Racing Fleets

PHRF time allowances (TAP) appear to be based on a scratch length of 100 feet, although rated lengths are not defined. If we assume the same A and B values as the NAYRU tables, we can define a hypothetical rated length (RP) and write,

$$TAP/3600 = 0.6/\sqrt{RP} - 0.06 \text{ hours/mile}$$

where TAP is in the usual PHRF units of sec/mile. From this, we have $1/\sqrt{RP} = TAP/2160 + 0.1$ and the equivalent TCF would be,

$$TCF = 0.185 / (TAP/2160 + 0.185) = 1 / (TAP/400 + 1)$$

7.3.4 Portsmouth Numbers

Portsmouth Numbers (PN) define the time correction factor,

$$TCF = 100/PN$$

and from equation (1), the equivalent time allowance is given by,

$$TA = (PN/100 - 1) / V_0 \text{ hours/mile}$$

where V_0 knots is the average speed of the standard yacht having PN = 100. This is valid for any assumed value of V_0.

Because the standard yacht is small, most yachts would have negative time allowances, which might be confusing. A method for "shifting" the standard yacht to avoid this is discussed later.

7.3.5 Atlantic Speed Potential Numbers

The ASPN system defines the time correction factor,

$$TCF = ASPN/100$$

and from equation (1), the equivalent time allowance is given by,

$$TA = (100/ASPN - 1) / V_0 \text{ hours/mile}$$

where V_0 is the average speed of the yacht with ASPN = 100, but this is valid for any assumed V_0 value. A shift to a larger yacht will be found desirable, as discussed later. In particular, the importance of correlating this most direct of TCF based systems with the most popular of TA systems, PHRF, suggests that a value of V_0 should be chosen so as to bring ASPN time allowances to a common base with PHRF.

7.4 COMPARISON OF SYSTEMS

Most of the above TCFs and TAs are based on different scratch yachts. To correlate data from the various systems we have to bring them to a common base. We choose TCFs to do this because of their direct relation with speed. If we plot TCF values versus the square root of overall lengths (L_0), we find that the data for each system can be represented, with reasonable scatter, in the form,

$$TCF = C / (1.1\sqrt{L_0} + 0.085)$$

where C is a different constant for each system. The precise values will depend on the data available at the time, of course, but the following are representative:

IOR C = 0.16 PN,US C = 0.314 PHRF C = 0.1863

LOR C = 0.18 PN,UK C = 0.262 ASPN C = 0.2935

MORC C = 0.235

If we use the ASPN as the simplest common base for TCFs, we can then propose approximate formulae for direct comparison by multiplying all the previous TCF expressions by the ratio of 0.2935 over the appropriate C value for each system. Hence, relative to the yacht with ASPN = 100, we have the following estimated TCFs:

TCF(ASPN) = ASPN / 100

TCF (IOR) = 0.340 / (1/√R + 0.085)

TCF (LOR) = 0.302 / (1/√R + 0.085)

TCF(MORC) = 0.333 / (1/√R + 0.098)

TCF(PHRF) = 1.575 / (TAP/400 + 1)

TCF(PN,US) = 93.5 / PN

TCF(PN,UK) = 112.0 / PN

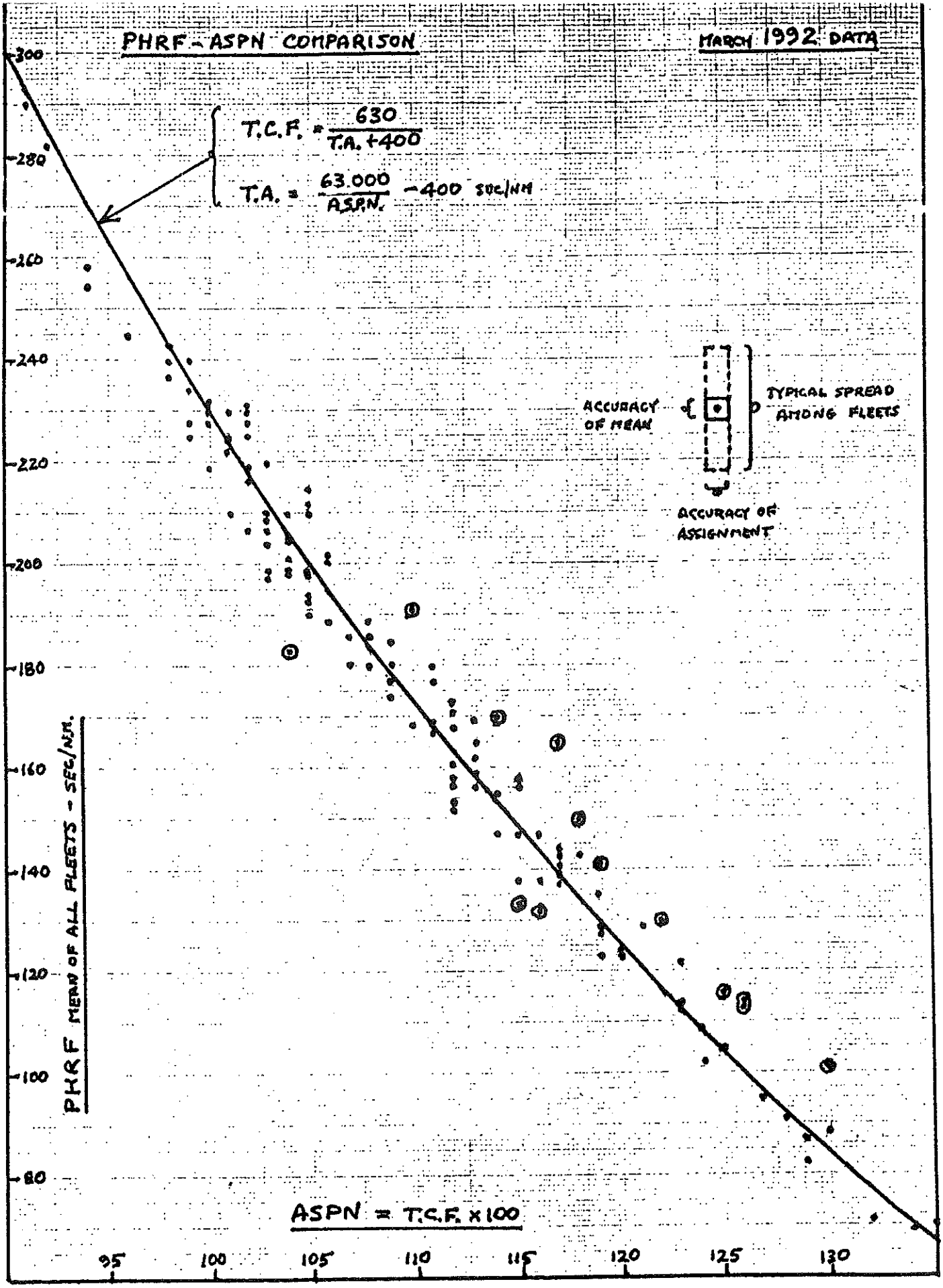
The rating R is in feet, appropriate to each measurement rule.
TAP is in seconds per nautical mile.

7.5 P.H.R.F. - A.S.P.N. COMPARISON

Of the above formulae, that for PHRF is the most reliable, because the writer has more up-to-date data common to PHRF and ASPN than for other systems. These data, covering some 150 types of yachts, are presented on the next page, where time allowances representing the mean of all PHR Fleets are plotted against the corresponding ASPNs for those types.

The line shown is the above formula, and only the circled points lie more than 0.02 TCF (2 ASPN points) away from the line. Indeed, this scatter is similar to that found between various fleets within PHRF. We can conclude that the ASPN system follows PHRF, not only in principles but in practice, and that a reliable conversion from PHRF time allowances to time correction factors is provided by the above formula, which can be simplified to,

TCF = 630 / (TA + 400) with TA in sec/mile. (5)


PHRF - ASPN COMPARISON
MARCH 1992 DATA
T.C.F. = 630 / T.A. + 400
T.A. = 63.000 / A.S.P.N. - 400 SEC/NM
ACCURACY OF MEAN
TYPICAL SPREAD AMONG FLEETS
ACCURACY OF ASSIGNMENT
PHRF MEAN OF ALL FLEETS - SEC/N.M.
300
280
260
240
220
200
180
160
140
120
100
80
ASPN = T.C.F. x 100
95
100
105
110
115
120
125
130

Inversely, ASPNs can be converted to PHRF time allowances with,

$$TA = (63000/ASPN) - 400 \quad \text{sec/mile.} \qquad (6)$$

Through this PHRF correlation, we have effectively set the value of V_0 needed to "shift" the ASPN TAs into line with PHRF. To find that value, we note from the correlation that ASPN = 100 corresponds to a PHRF TA of 230 sec/mile, whereas the ASPN TA in Section 7.3.5 would be zero for that yacht. We shift the TAs by adding 230 sec/mile to the earlier formula, and equate with (6).

$$(100/ASPN - 1)(3600/V_0) + 230 = (63000/ASPN) - 400$$

or $$(100/ASPN - 1)(3600/V_0) = 630(100/ASPN - 1)$$

Hence $V_0 = 3600/630 = 5.71$ knots.

If we accept the PHRF - ASPN correlation, we can suggest the correspondingly shifted TAs for Portsmouth Numbers in the form,

$$TA(PN,US) = 6.74\ PN - 400 \quad \text{sec/mile}$$

$$TA(PN,UK) = 5.62\ PN - 400 \quad \text{sec/mile}$$

but with the caution that the data base for PN was small. Fleets using Portsmouth Numbers regularly will be able to refine these estimates.

For convenient conversion of PHRF time allowances into time correction factors, a table is provided on the following page, using equation (5) above.

7.6 OTHER T.C.F. ESTIMATES

Other major PHR Fleets have started to use time-on-time correction. Readers should beware that several conversion formulae in use are physically wrong. Statistical methods can fit many kinds of curves to a particular set of data, and may be fine for those data. However, outside the range of data used to derive the formulae, they can go wildly astray.

Physically, TAs and TCFs are inversely related, so we require an expression in the form,

$$TCF = \text{1st constant} / (\ TA + \text{2nd constant}\ )$$

We know of only one other formula of this form in use; that being proposed by PHRF - North West. At first glance, their expression,

$$TCF = 600 / (TA + 480)$$

looks very different from (5), but it is "shifted" to give TCF=1 to a yacht with TA of 120 sec/mile instead of 230 sec/mile. If we think of this shift of 110 added to TA and look at their formula rewritten in the form,

$$TCF = 600 / [(TA+110) + 370\ ]$$

it is seen to be quite similar to our expression (5). We cannot show their curve superimposed on ours, because of this shift, but in fact the differences lie within the expected scatter from the PHRF mean.

TIME ALLOWANCE - TIME CORRECTION FACTOR CONVERSION

Based on PHRF-ASPN correlation, equation (5)

TA	TCF	TA	TCF	TA	TCF
sec n.m.	ASPN 100	sec n.m.	ASPN 100	sec n.m.	ASPN 100
33	1.455	123	1.205	213	1.028
36	1.445	126	1.198	216	1.023
39	1.435	129	1.191	219	1.018
42	1.425	132	1.184	222	1.013
45	1.416	135	1.178	225	1.008
48	1.406	138	1.171	228	1.003
51	1.397	141	1.165	231	.998
54	1.388	144	1.158	234	.994
57	1.379	147	1.152	237	.989
60	1.370	150	1.145	240	.984
63	1.361	153	1.139	243	.980
66	1.352	156	1.133	246	.975
69	1.343	159	1.127	249	.971
72	1.335	162	1.121	252	.966
75	1.326	165	1.115	255	.962
78	1.318	168	1.109	258	.957
81	1.310	171	1.103	261	.953
84	1.302	174	1.098	264	.949
87	1.294	177	1.092	267	.945
90	1.285	180	1.086	270	.940
93	1.278	183	1.081	273	.936
96	1.270	186	1.075	276	.932
99	1.263	189	1.070	279	.928
102	1.255	192	1.064	282	.924
105	1.248	195	1.059	285	.920
108	1.240	198	1.054	288	.916
111	1.233	201	1.048	291	.912
114	1.226	204	1.043	294	.908
117	1.219	207	1.038	297	.904
120	1.212	210	1.033	300	.900

Each fleet should remain free to evaluate the constants that best fit their locally pertinent data. They are strongly advised to use the physically correct relationship, however. For fleets without an adequate data base, we can recommend formula (5). The NSYA fleet has a long history of time-on-time correction, and its correlation has been refined over the years that PHRF data has been available.

7.7 MIXED TIME CORRECTION SYSTEMS

Much has been written on the relative advantages of time-on-distance and time-on-time corrections, and with half the world favouring one and half the other, much more will be written. We do not intend to add to the elements noted in Section 1.3. The simple fact is that neither method is correct.

Fleets can only experiment to see which is better suited to their local conditions and to the types of races they run. Such experiments, however, could easily be extended to a "search for the truth", or at least for a closer approach to it, by considering a mixed correction system that lies between the two.

Following the notation used in Section 7.2, and using units of hours and nautical miles, such a mixed correction could be represented by,

$$T_C = T\,[M + (1\text{-}M)(TCF)] - M(TA)D$$

where M is a "mixing" fraction indicating the proportion of time-on-distance correction used. When $M = 1$, this expression becomes the normal TA corrected time. When $M = 0$, it becomes the normal TCF corrected time.

It is suggested that a low value of M, perhaps 1/4 or 1/3, may prove best for Olympic style courses, and a higher value, perhaps 2/3 or 3/4, may prove best for elongated courses. However, we are not aware of any fleet trying this kind of experiment yet, and merely put forward the concept as an interesting line for research.

NOVA SCOTIA YACHTING ASSOCIATION

CONVERSION OF A.S.P.N. TIME CORRECTION FACTORS TO P.H.R.F. TIME ALLOWANCES

ASPN 100TCF	PHRF Sec/NM	ASPN 100TCF	PHRF Sec/NM	ASPN 100TCF	PHRF Sec/NM
81	378	101	224	121	121
82	368	102	218	122	116
83	359	103	212	123	112
84	350	104	206	124	108
85	341	105	200	125	104
86	333	106	194	126	100
87	324	107	189	127	96
88	316	108	183	128	92
89	308	109	178	129	88
90	300	110	173	130	85
91	292	111	168	131	81
92	285	112	163	132	77
93	277	113	158	133	74
94	270	114	153	134	70
95	263	115	148	135	67
96	256	116	143	136	63
97	249	117	138	137	60
98	243	118	134	138	57
99	236	119	130	139	53
100	230	120	125	140	50
				(146	32)
				(159	- 4)

Time Allowance = 63000/(ASPN) - 400 Sec/NM

MAY 1993

SIZE OF CREW

The NSYA has no desire to limit the number of crew sailing on any yacht. However, Race Committees of prestigious events should be aware that the ASPNs in this list have been derived from the results of races sailed with normal crews. They may wish to control the possibility of a yacht gaining unfair stability by embarking abnormal "movable ballast". For their guidance only, when writing an appropriate Sailing Instruction, the following table suggests the maximum crew size considered applicable to these ASPNs, based on 160 lb adults.

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CONVERSION OF A.S.P.N. TIME CORRECTION FACTORS TO P.H.R.F. TIME ALLOWANCES

Time Allowance = 63000/(ASPN) - 400 Sec/NM

ASPN 100TCF	PHRF Sec/NM	ASPN 100TCF	PHRF Sec/NM	ASPN 100TCF	PHRF Sec/NM
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86	333	106	194	126	100
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88	316	108	183	128	92
89	308	109	178	129	88
90	300	110	173	130	85
91	292	111	168	131	81
92	285	112	163	132	77
93	277	113	158	133	74
94	270	114	153	134	70
95	263	115	148	135	67
96	256	116	143	136	63
97	249	117	138	137	60
98	243	118	134	138	57
99	236	119	130	139	53
100	230	120	125	140	50

NOTES