

Continuing Development of a Computerized NAR Contest Manager

Research & Development project
NARAM-42

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Abstract

The continuing development of a standalone computer application, ContestManager, is presented. The application is designed to ease the tedious process of data entry and tabulation during and after a contest. Setting up a contest is simply a matter of selecting the events to be flown from a list of choices. All calculations for data reduction and points tabulation are handled internally. The program was originally tested at various Open and Regional Meets and provided accurate results in real time, rather than waiting for hours after the contest for the results to be computed. ContestManager served as a backup data system at NARAM-40 and the primary data system at NARAM-41. This year, ContestManager has been widely used by many different clubs and will again be used as the primary data system at NARAM-42.

Introduction

Running an NAR contest involves a great deal of data processing and record keeping that the contestants rarely see. The Contest Director has to go through many repetitive calculations for such tasks as averaging timing data, reducing altitudes, averaging scores, and awarding points. The calculations themselves are not difficult, but the sheer number of calculations makes the job tedious and time-consuming. Computers, however, are ideally suited for these types of tasks, so the development of a computerized data-entry system for NAR contests would be extremely beneficial to the hobby.

Several computerized solutions already exist, but are not widely used. A FileMaker Pro database has been used for data-entry at previous NARAMs. This system was extremely difficult to setup for a contest, essentially requiring the author to custom-design the database each time it is used. Operation is also difficult and requires extensive training, which limits the number of users who can do data entry. Several people have developed spreadsheets to handle data tabulation. Although the operation of such spreadsheets is easier than the FileMaker Pro database, the spreadsheets must still be custom-designed for each contest.

This project describes the continuing development of ContestManager, which is a standalone application for data entry and processing for NAR contests. ContestManager was originally developed based on Glenn Feveryear's spreadsheet first used at RAMTEC-5. The goal of the project was to develop a user-friendly, standalone application for recording contest flight data and processing NAR points. Preliminary versions of ContestManager were tested at ECRM-25 and RAMTEC-6 regional meets, and presented for Research & Development at NARAM-40. Many positive comments were received at NARAM-40 and were incorporated into the final version. ContestManager was also used as a comparison against the FileMaker Pro database for NARAM-40. Several errors in results processing were identified, including one case where 4th place was awarded for a flight which should have only received flight points due to a lack of a return.

During the 1998-1999 contest year, ContestManager was tested extensively by NARHAMS, SPAAR, and PARA sections. Their useful suggestions for features to add and bugs to fix resulted in the release version used at NARAM-41. After a few minor bug fixes, ContestManager performed flawlessly as the primary data system at NARAM-41. Due to limitations in ContestManager at the time, preliminary results for Sport Scale static points and Research & Development project titles were

tabulated using a spreadsheet. Although ContestManager could have handled the final results, the contest officials chose to use their spreadsheet instead. This resulted in an awkward moment at the awards ceremony when the judges tried to withhold places in Research & Development. Had ContestManager been used for these results, the error would have been caught much sooner.

During the 1999-2000 contest year, ContestManager has been used by many different clubs. Very few bugs were uncovered, but several new features have been added based on user suggestions. The most notable additions are added fields for the various points categories and prototype design in craftsmanship events, as well as the project title for Research & Development. A full list of the changes since last year is presented below.

Methods

The ContestManager program is written entirely in the C++ programming language, using Microsoft's Visual C++ Version 6.0 and the Microsoft Foundation Class (MFC) library. Initial development was on a 180 MHz PentiumPro desktop computer, with later work done on a 300 MHz Pentium desktop computer. Field testing utilized a 150 MHz Pentium notebook computer. No personal money was spent on development.

One of the major benefits to the C++ language is the concept of inheritance, in which one object definition can be derived from another. For example, the generic object Shape defines a set of functions for displaying, moving, or saving shapes. One can then derive objects Circle and Square from Shape and be able to use those same functions without redefining them. New functions specific to each object class can also be added, such as calculation of area for Circle and Square. In this example, Circle and Square are said to be inherited from the base class Shape.

This concept of inheritance is used extensively to handle all of the different types of NAR events. Figure 1 shows the class hierarchy for the events. Every event is derived from CFlight, which handles the most basic functions such as formatting results and points for display, which are common to all events. CDuration and CAltitude are both derived from CFlight to provide functions for calculating average times and altitudes, respectively. A new class, CCraftsmanship, was added this year to allow the static and flight points for each category to be stored more easily.

A summary of the data hierarchy is shown in pseudo code in Figure 2. CContestManagerDoc, derived from the MFC class CDocument, manages all of the data for a single document representing

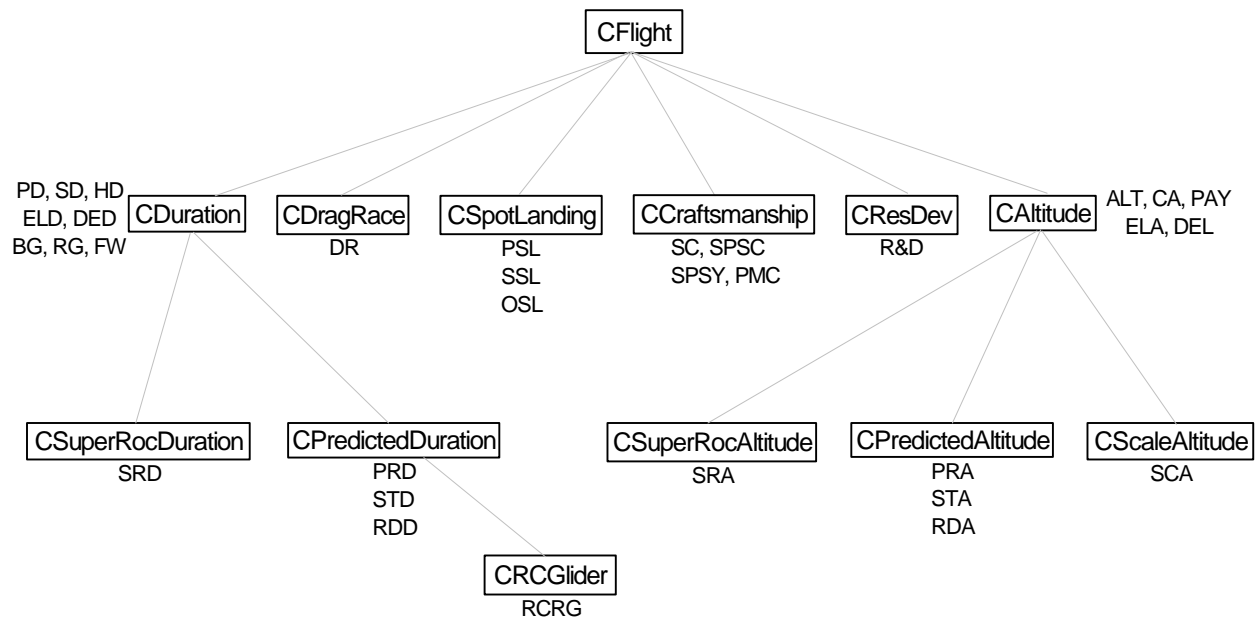


Figure 1. Class hierarchy for events

CContestManagerDoc

string	contestName
integer	contestType
integer	altitudeReductionMethod
boolean	useRedundantTrackers
string	trackingStation1Label
string	trackingStation2Label
CEventInfo[]	events
CContestant[]	contestants

CContestant

string	contestantName
string	NARnumber
integer	division
integer	sectionNumber
string	sectionName
integer	totalPoints
integer	preNaramPoints
integer	place
CEventHeader[]	events

CEventInfo

integer	eventID
integer	weightingFactor
float	baseline
integer	target
boolean	isMultiround
integer	multiroundMax

CEventHeader

CEventInfo*	eventInfo
integer	score
integer	points
integer	place
CFlight[]	flightData

CFlight

CEventHeader*	eventHeader
integer	score
boolean	returned
boolean	disqualified
integer	comment

Figure 2. Data hierarchy

one contest. The contestType field specifies whether the contest is a Section, Local, Open, Regional, or National Meet. The Contest Factor, used for calculating contest points, is read from a table for all but National Meets, which are calculated internally based on the events at the meet.

For each event, there is a CEventInfo object, which defines information common to the entire event, such as baseline for altitude events and target altitude or duration for precision events. Each contestant is handled by a CContestant object, which is stored as an array in CContestManagerDoc and sorted by the contestant's name. The NAR number, age division, section number, and section name are also stored for each contestant. The total points awarded to the contestant at this meet are also stored here, along with pre-NARAM points for National Meets.

Flight data is stored for each contestant in an array of CEventHeader objects, one for each event. The CEventHeader object has a pointer back to the CEventInfo object for that event to reference data common to the entire event. The total score for the event and NAR points awarded are also stored here. Each flight is a CFlight-derived object for the particular event and is stored as an array within CEventHeader.

At smaller meets, it is often necessary to combine age divisions so that there are at least two entries per combined division per event. The current age divisions are A (7 - 13 years), B (14 - 18 years), C (19+ years), and T (teams). When there is only one entry in a given division for an event, that division must be combined with one or more adjacent divisions according to age. T Division is defined according to the age of the oldest team member, which nearly always makes it equivalent to C Division. ContestManager makes the assumption that T Division is always equivalent to C Division. In this manner, divisions can be combined in various ways such as A/B/CT, AB/CT, A/C/BT, ABC/T, etc.

Prior to updating the standings for each event, ContestManager counts the number of entries per division for that event and identifies which divisions have fewer than two entries. It then proceeds through a long series of logic steps to produce a valid set of combined divisions. To maximize the total points awarded, the number of entries combined is minimized. For example, with 2 A Division, 1 B Division, 3 C Division, and 3 T Division entries, A and B Divisions would be combined. However, with 3 A Division, 1 B Division, 3 C Division, and 2 T Division entries, B and T Divisions would be combined. These combinations are reevaluated for each event, so it is possible to have different division combinations for different events. While this may be somewhat confusing, and is

therefore rarely done when scoring events manually, it does have the advantage of awarding the maximum number of points overall. Contest Board Chairman Tom Lyon has also given his approval for this method of combining divisions.

Results

When the application is first run, it prompts the user for a name and type for the new contest (Figure 3). After the contest is named, the user specifies events for the contest (Figure 4). The input fields for motor selection, multiround, baseline, and target altitude or duration update automatically

depending on the event selected. The total weighting factors selected for the meet are also displayed, and a warning message is given if the total is greater than the maximum allowed for the type of contest specified. After selecting the events, contestants may be added (Figure 5). The NAR section name is filled in automatically based on the section number. For National Meets, pre-NARAM points are also input so that the national champion standings may be calculated at the conclusion of the meet. Contestants may be added, removed, or changed at any time, so the user need not enter them all at once.

Flights are recorded through the Edit Flight Data dialog box. Examples for duration and altitude events are shown in Figures 6 and 7, respectively. The user selects the contestant and event and enters the information for the new flight. Alternatively, the NAR number of the contestant may be typed in, and that contestant is selected. All necessary calculations such as averaging of timer results, altitude data reduction, and rounding of scores are done automatically upon adding the new flight. There are also boxes to check for return or disqualification, as well as a list of comments, which is normally used as an explanation for a disqualified flight.

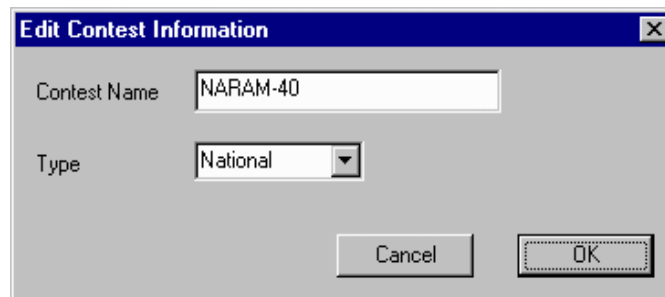


Figure 3. Contest Information dialog box

Edit Event Information [X]

Selected Events:

- 1/4A Parachute Duration, 7 WF
- 1/2A Flex-Wing Boost Glider Duration Multiround, 21 WF
- 1/2A Boost Glider Duration, 17 WF
- B Helicopter Duration, 21 WF
- B Streamer Duration Multiround, 13 WF
- B Altitude, 500.0 m Baseline, 11 WF**

Remove

Weighting Factors: 90

Add Event: Motor Class: Add

Baseline: meters

Cancel OK

Figure 4. Event Information dialog box

Edit Contestant Information [X]

Name: (Last, First)

NAR Number:

Division:

Section Number:

Section Name:

Add Remove Cancel OK

Figure 5. Contestant Information dialog box

Edit Flight Data [X]

Name: Ash-Poole, Jennifer [v] NAR#: 61415

Event: B Rocket Glider Duration [v]

Flight Number: Flight 1 [v]

Timer 1: 79.38 seconds

Timer 2: 78.07 seconds

Average: 79 seconds

Returned Comment: Official Flight [v]

Disqualified

[Add] [Remove] [Cancel] [OK]

Figure 6. Flight Data dialog box for duration event

Edit Flight Data [X]

Name: O'Neal, Dave [v] NAR#: 16856

Event: 1/2A Super-Roc Altitude [v]

Flight Number: Flight 2 [v]

Length: 100.0 cm

Azimuth: East 63.0 West 46.0

Elevation: 41.0 34.0

Altitude: 129.3 meters

Closure: 2.9 %

Average: 129 meters

Returned Comment: Official Flight [v]

Disqualified POSSIBLE NEW RECORD

[Add] [Remove] [Cancel] [OK]

Figure 7. Flight Data dialog box for altitude event

Appendix A contains printouts of the various views using the RAMTEC-8 data file. A summary of all of the flight results in a spreadsheet-like format is shown in Appendix A1. This view provides a fast and convenient way to see all of the results at once. Results shown in red indicate that the contestant has not fulfilled the return requirements for that event, and can only receive flight points. To make data entry easier, double-clicking on a cell automatically brings up the dialog to edit that field. The user can also switch from showing flight results to showing NAR points for each event, as well as totals for each contestant (Appendix A2). This view is particularly useful for the Contest Director to fill in the points form for the Contest Board since the display is nearly identical to that form.

The standings view (Appendix A3) is used to show the places for each entry in each event. This view may be printed in its entirety, or one event at a time, which is useful for posting results for contestants to view at the meet. The meet champions view (Appendix A4) shows the contestants sorted by the points awarded at that meet. The NARAM points view is only available for National Meets and shows each contestant's pre-NARAM, NARAM, and total contest year points, sorted alphabetically by the contestant names. Finally, the National Champions view displays the same information, but sorted by total contest year points.

The version history for the development of the project is shown in Appendix B. Since the 1.0.1 version was presented at NARAM-41, a more work has been done in adding features and debugging. Reports from users of many different sections have been most helpful in identifying bugs and suggesting new features. Changes in the past year include the following:

- ? Flights marked Disqualified have the comment automatically set to Disqualified.
- ? Returned flights with the comment "No Return" are automatically set to "Official Flight".
- ? Standings view shows "NR" for flights where a required return has not been made.
- ? Standings view now includes 3 columns for altitude events to allow for re-flights.
- ? Points are now calculated correctly for Super-Roc Altitude when track lost or no closure.
- ? Added prototype name and points category sub-totals for static and flight points in craftsmanship events.
- ? Added field for R&D project names.
- ? Added contestant section number to points view.

- ? Added range checks for Super-Roc and Predicted Altitude/Duration events to ensure the length, altitude, and time are within the event specifications.
- ? Added support for Radio-Controlled Rocket Glider event.
- ? Added feature to import flight data from another contest file. This will allow better management of large contests such as NARAM by allowing a separate file for each event. These files can later be merged to create the master file with all the data.

For the future, work will continue to keep ContestManager up-to-date with the latest rules changes. New features will also be added as they are requested by users. One feature that will likely be included very soon is a printout of a points award sheet for direct submission to the contest board, thus eliminating the need for copying results to another form. The Macintosh version of ContestManager is also currently being beta tested and should be available for general release during the 2000-2001 contest year.

Conclusions

ContestManager has proven to be a great success in all respects. It is a standalone application, not requiring the use of Excel, Access, or Filemaker to run. It has been used at many different types of meets with a wide variety of events. ContestManager provides fast and accurate flight results with unprecedented simplicity and ease of use.

Acknowledgments

I am very grateful to Glenn Feveryear for providing the original idea and many suggestions for improvements to the project. Jennifer Ash-Poole served as my primary beta tester. Many thanks go out to all of the people who have used ContestManager at their meets and gave me suggestions for further improvements.

Appendix A

ContestManager Printouts from RAMTEC-8

Appendix B

Version History

1.0b1 May 15, 1998

first major test at ECRM-25, May 16-17, 1998

- Bugs: Eggloft events scored as sum of two instead of best single flight (fixed 1.0b2)
- Scale Altitude puts altitude in score edit field (fixed 1.0b2)
- Scale Altitude should still display points even for TL (fixed 1.0b2)
- Altitude reduction does not check for all 0 (i.e., both stations TL) (fixed 1.0b2)
- Altitude reduction: closure should be absolute value (fixed 1.0b2)
- All places should be awarded, even in the case of ties, per Tom Lyon (fixed 1.0b2)

1.0b2 June 12, 1998

tested at OPOSSUM-2, June 13, 1998

- New: new method for combining divisions. ugly, but it works
- Bug: points need to be recalculated after adding a contestant (fixed 1.0b3)
- Feature Requests:
 - show total points for each contestant (added 1.0b3)
 - output data in text and html formats (added 1.0b4)

1.0b3 June 18, 1998

tested at RAMTEC-6, June 19-20, 1998

- Bugs: Multiround is +4 WF, not +2 (fixed 1.0b4)
 - no return needed for multiround events. up to the CD to ensure only 2 models used
 - scroll bar only scrolls by 5 lines, not 1 page (fixed 1.0b4)
 - page up/page down keys not supported (fixed 1.0b4)
 - average time does not handle time lost by 1 timer (i.e., 0 time for 1 timer) (fixed 1.0b4)
- Feature Requests:
 - show total points by section
 - fill in section names automatically when adding contestants (added 1.0b4)
 - import contestant database for NARAM
 - draw points in red if no returns for a required return event (added 1.0b4)

1.0b4 August 6, 1998

presented as R&D project for NARAM-40. won 3rd place

- New: fixed memory leaks for flight data
- cleaned up flight dialog
- NARAM contest factor calculated correctly
- added geodesic altitude reduction

1.0b5 October 9, 1998

tested at MATTHEW-2, October 10, 1998

- New: NAR number displayed in edit flight dialog
- Entering NAR number in edit flight dialog loads that contestant times in minutes, e.g. 1:30.00, converted to seconds automatically

added redundant tracking by 4 stations
altitude reduction/redundant tracker prefs now stored with each document
cleaned up data structures to remove redundancy. file size reduced by 25%
added check for new records
display standings
printing support added
R&D and drag race scores are places (eg score of 1 = 1st place)
added various warning messages
fixed several bugs with Precision Duration
added online Pink Book

Bugs: changing the name of a contestant after added really screws up ordering
DR does not need a return

1.0b6 November 12, 1998

New: "Score" label changed to "Place" for DR and R&D flight data dialog
fixed a bug in HTML output
fixed a bug with points being awarded for DQs in single-flight events
added a check to make sure everyone has an NAR or Team number
added preference for tracking station names

1.0b7 November 20, 1998

beta tested by Jennifer Ash-Poole

New: fixed bug with weighting factors not displayed properly in Edit Events dialog
fixed bug with "add flight" error messages on changing flights
fixed bug with displaying results of spot landing in cm

Bugs: non-numbers allowed for certain edit fields in flight dialog (fixed 1.0b8)
altitudes calculated by vertical midpoint never close (fixed 1.0b8)
points calculated incorrectly for DQs in events where minimum score wins (fixed 1.0b8)

1.0b8 January 25, 1999

first public release

Bugs: OSL result > 50 m can still place (fixed 1.0b9)
OSL no distance input treated as track lost (fixed 1.0b9)
Standings view wraps around for large contests in Win95 (fixed 1.0b9)

1.0b9 February 25, 1999

New: improved error checking in flight dialog
added field for pre-NARAM points
display meet champions, national champions
display section point totals
events can now be changed after contestants are added
section list moved to external dat file
standings printed 1 event per page
added option to print standings in only one event at a time

1.0b10 May 14, 1999

tested at ECRM-26, May 15-16, 1999

- New: fixed bug which prevented changes to contestant information after entering
fixed bug where section points were not updated when a contestant changed sections
fixed bug where the event info was not displayed correctly on initial update
baseline can now be changed after event is added
target for set/random altitude/duration can now be changed after event is added
fixed bug which caused error message when removing contestant
- Bugs: SRD/SRA only accept integer values for length (fixed 1.0b11)
B division combined with A on some events, T on others (not a bug)
missing time averaged as 0 (fixed 1.0b11)

1.0b11 May 17, 1999

- New: IND listed in section point totals
SRD/SRA lengths now accept decimal values
when only B division needs to be combined, go with fewer entries in A or T divisions
better checking for missing timer/tracking entries

1.0b12 May 20, 1999

- New: fixed bug with initializing of US Records
cluster, payload, eggloft flights automatically marked NR if not returned
cluster, payload, eggloft flights get 0 points if not returned
fixed bug where target/baseline do not update properly after removing an event

1.0b13 June 15, 1999

- New: added NAR/Team numbers to results and points views
added option to print standings as displayed on screen or one event per page
added margins to results and points printouts
added drop down list of section numbers to Add Contestant dialog box

1.0 July 27, 1999

- New: removed close boxes from dialogs
added checks for altitude and timer data for track lost or malfunctioning timer
events with static points count the first "flight" as static, rest as total points
added tracking data calculator for non-contest flights
fixed bug in rounding scores for super-roc
fixed bug in updating pre-NARAM section points in add contestant dialog
added automatic checking for multiround max
fixed bug in displaying section standings
fixed bug which required score for OSL, even if DQ
fixed bug when changing contestant's name

1.0.1 July 27, 1999

- New: fixed bug which caused crash on adding contestants

1.0.2 August 9, 1999

New: fixed bug where DQed flight could be marked returned
fixed bug in Records.dat file for C Payload RC Altitude, C Division

1.0.3 August 9, 1999

New: DQed flights automatically set comment to DQ
Returned flights with comment "No Return" automatically set to Official
fixed bug with returns on payload

1.0.4 August 10, 1999

New: NR displayed on standings view for non-returned flights when return needed
3 flights displayed in standings view for altitude events
fixed a bug in calculating points for SRA when TL or NC

1.1 October 24, 1999

New: added points categories for craftsmanship events
support for static versus flight points for craftsmanship events
added fields for prototype name and R&D project name
added version checks to preferences file
added contestant section number on results and points views
added range checks for super-roc, predicted altitude/duration
fixed a bug where flight points could be awarded for only 1 contestant entry
added support for RC Glider
better error checking for event setup
more descriptive error messages

1.1.1 May 25, 2000

New: fixed bug which allowed double-clicking in meet champs windows
fixed several bugs in records processing
DQ entries in Craftsmanship events do not need to enter flight points
fixed bug which showed static points in SCA after DQ
cleaned up tab order in flight dialog

1.1.2 June 15, 2000

New: fixed bug where craftsmanship static points were not displayed

1.1.3 July 27, 2000

New: fixed bug with craftsmanship static points not sorting properly
fixed printing problems with standings view
added feature to import flight data from another file