Navigation plotting simulator NS-3000

Objectives

The simulator of the navigation pad is intended for training cadets of maritime educational institutions when studying the discipline "Navigation, pilot, navigation hydrometeorology, electronic cartography".

- ✓ implementation of the main types of navigation calculations;
- ✓ Observation with radar simulators and a visual direction finder;
- ✓ Radar surveillance and gaskets;
- ✓ performance of preliminary laying and wiring of the vessel along the route;

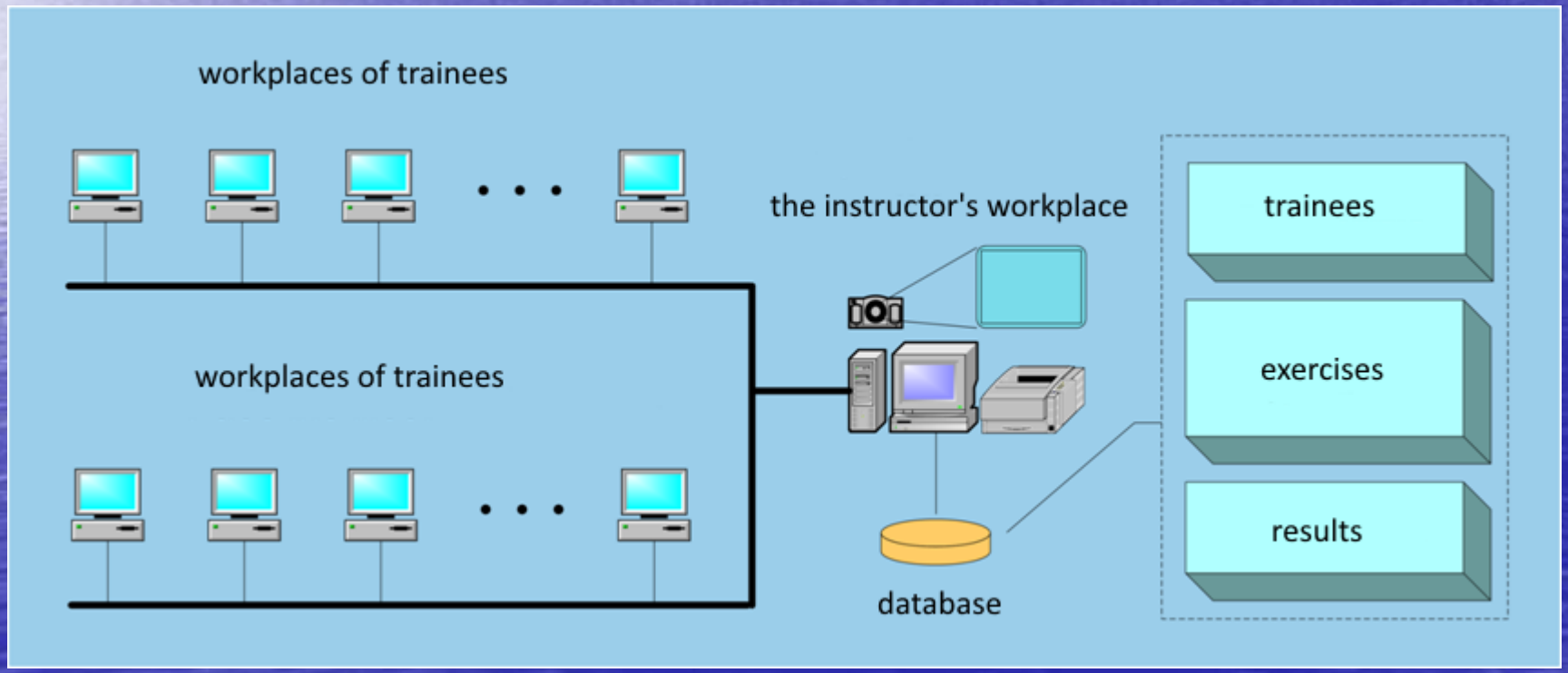
Main Features

- ✓ An instructor observing from his workplace the process of performing assignments by cadets;
- ✓ automatic generation of a unique task for each trainee;
- ✓ automatic evaluation of the results of the completed tasks according to the criteria specified by the instructor;
- ✓ archiving the results of the performed exercises;
- ✓ output of the trainee's work results to the instructor's monitor or printer;
- ✓ realistic display of radar information;
- ✓ Display of characteristic coastal objects on the simulator of the visual direction finder;
- ✓ control from the instructor's workplace by task parameters that affect the accuracy of navigation calculations;
- ✓ analysis of the level of training of cadets;

Structural scheme NS-3000

NS-3000 is built on the basis of a local computer network and includes:

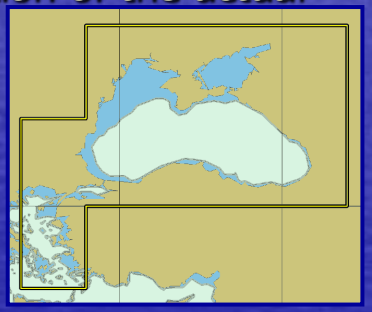
- ✓ the instructor's workplace (IW);
- ✓ up to 30 workplaces of trainees (TW);



The instructor's workplace (IW)

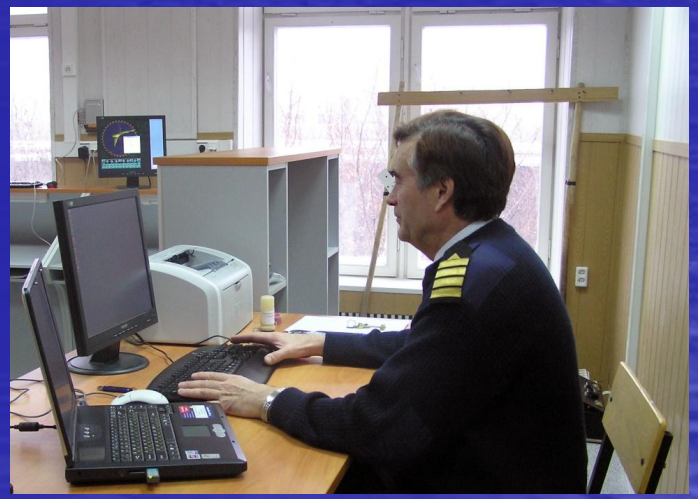
Software IW includes:

- ✓ The program of preparation and editing of tasks, built on the basis of an electronic cartographic system with electronic maps of the format CM-93/3.
- ✓ The training area is Black Sea, maps of Main Department of Navigation and Oceanography 32103 and 32104.
- ✓ The program of conducting classes and the baseline data. The training program automatically calculates two indicators of student performance: the deviation of the actual trajectory from the declared,
- ✓ exercise time



Software IW provides:

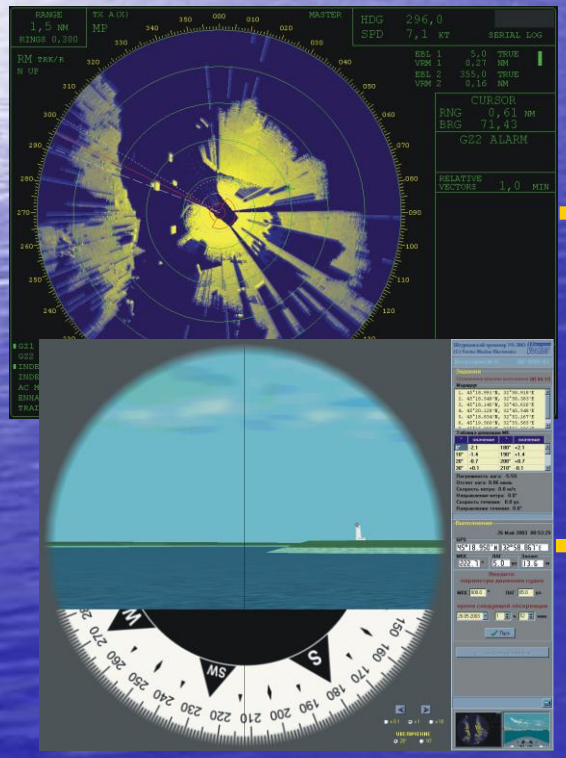
1. Observing from your workplace the process of performing assignments by cadets.
2. Automatic generation of a unique task for each trainee.
3. Automatic assessment of the results of completed tasks for the criteria specified by the instructor.
4. Archiving the results of the exercises.
5. Output of the trainee's work results to the instructor's monitor or printer.
6. Realistic display of radar information.
7. Display of characteristic coastal objects on the simulator visual direction finder.
8. Controlling parameters that affect accuracy navigation calculations (day / night, rain, wind, current, errors in navigation instruments).

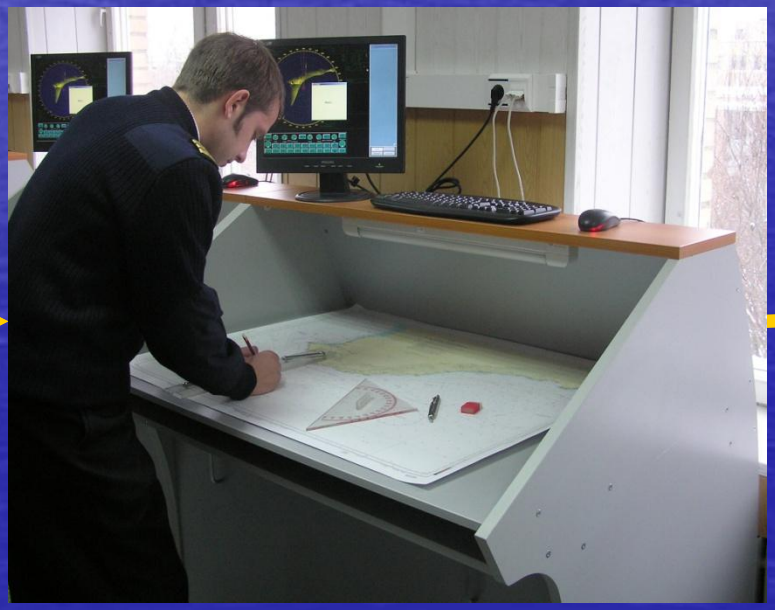


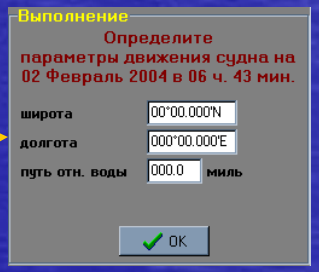
Workplaces of trainees (TW)

The workplace of the trainee includes:

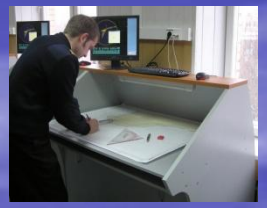
- ✓ simulator radar BridgeMaster E250;
- ✓ visualization system and imitator of the visual direction finder;
- ✓ three-dimensional radar and visualization scenes on areas of maps of Main Department of Navigation and Oceanography 32103 and 32104 with characteristic coastal objects;
- ✓ simulators of magnetic and gyrocompass, relative lag, echo sounder;
- ✓ chart table with a set of paper maps;
- ✓ a set of navigational instruments;



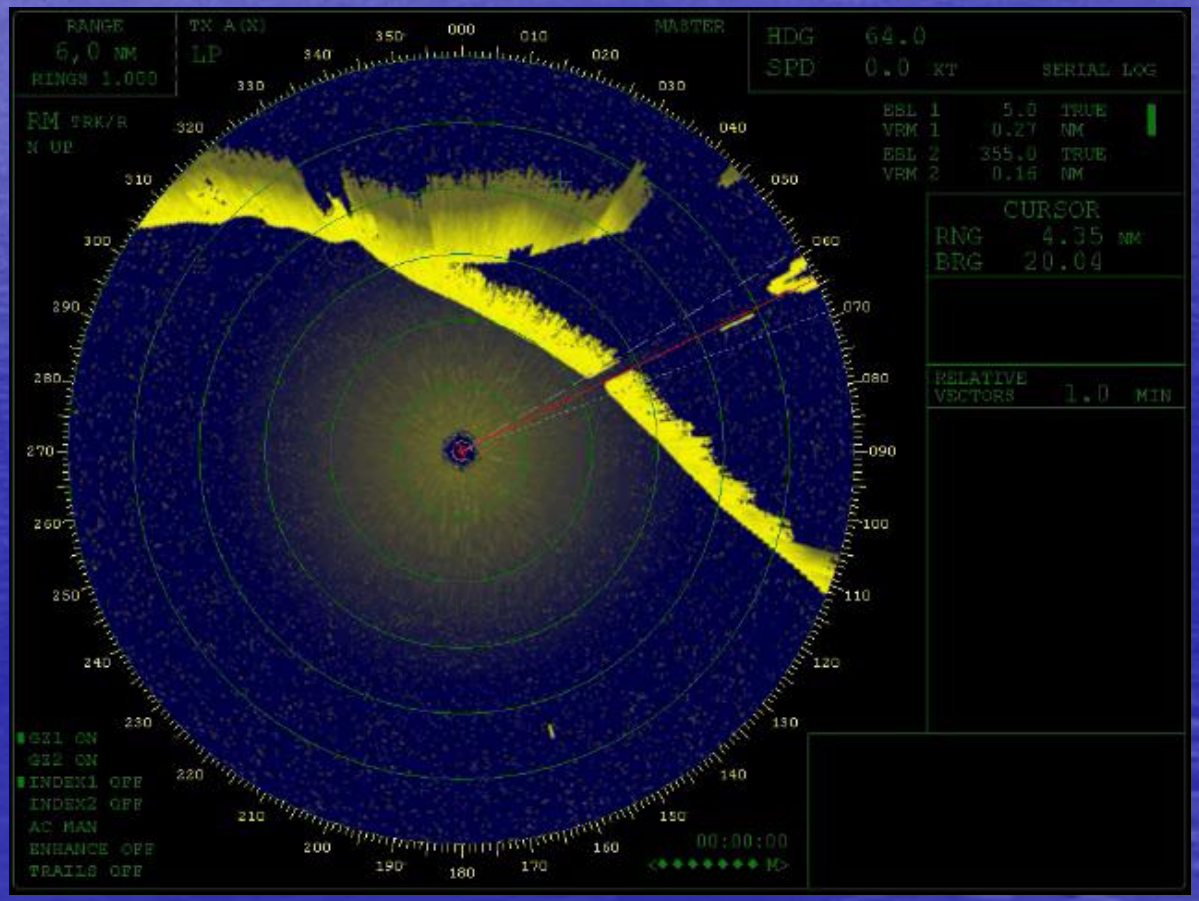




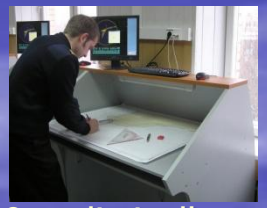
Workplaces of trainees (TW)



The simulator includes a radar / ARPA simulator BridgeMaster E250. Modeling the reflections of the signal from the relief of land and coastal objects, wind waves, hydrometeors, this simulator provides a high degree of realism of the radar picture. The simulator allows you to get all the necessary skills for working with radar / ARPA, including determining bearings and distances.



Workplaces of trainees (TW)



The simulator of the visual direction finder included in the navigation pad simulator NS-3000 realistically displays the relief of the earth's surface and characteristic shore objects that can be used to take reverse bearings to the landmarks and determine the location of the vessel.

Control of the simulator of the visual direction finder is carried out by means of two buttons that change the direction of the observer's view.

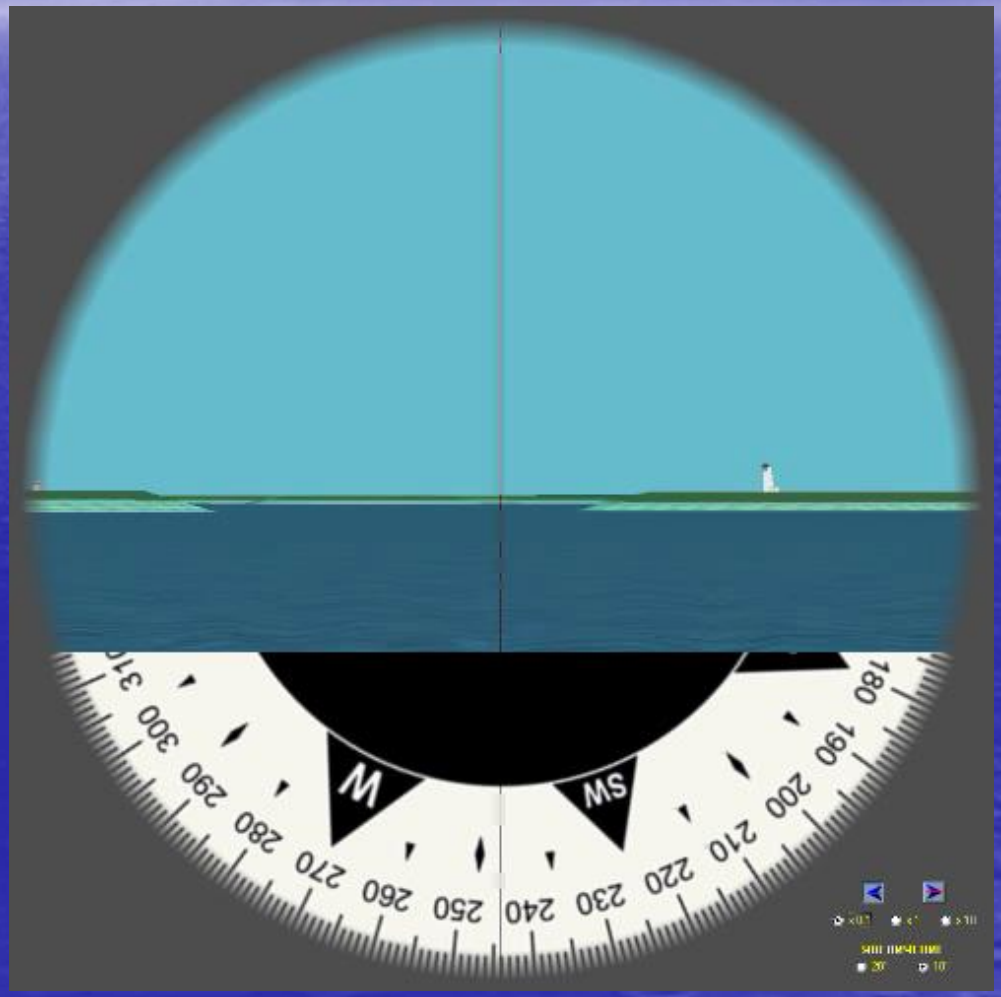
There are three gradations of the angle of observation of the visual pattern:

- ✓ in increments of 0.1°;
- ✓ in increments of 1°;
- ✓ in increments of 10°;

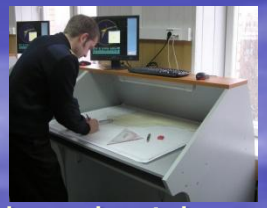
The simulator of the visual direction finder has two gradations of the image magnification:

- ✓ viewing angle 20°;
- ✓ viewing angle 10°;

The simulator of the visual direction finder also has an image of a part of a gyrocompass card for taking a reverse bearing on a visual object.

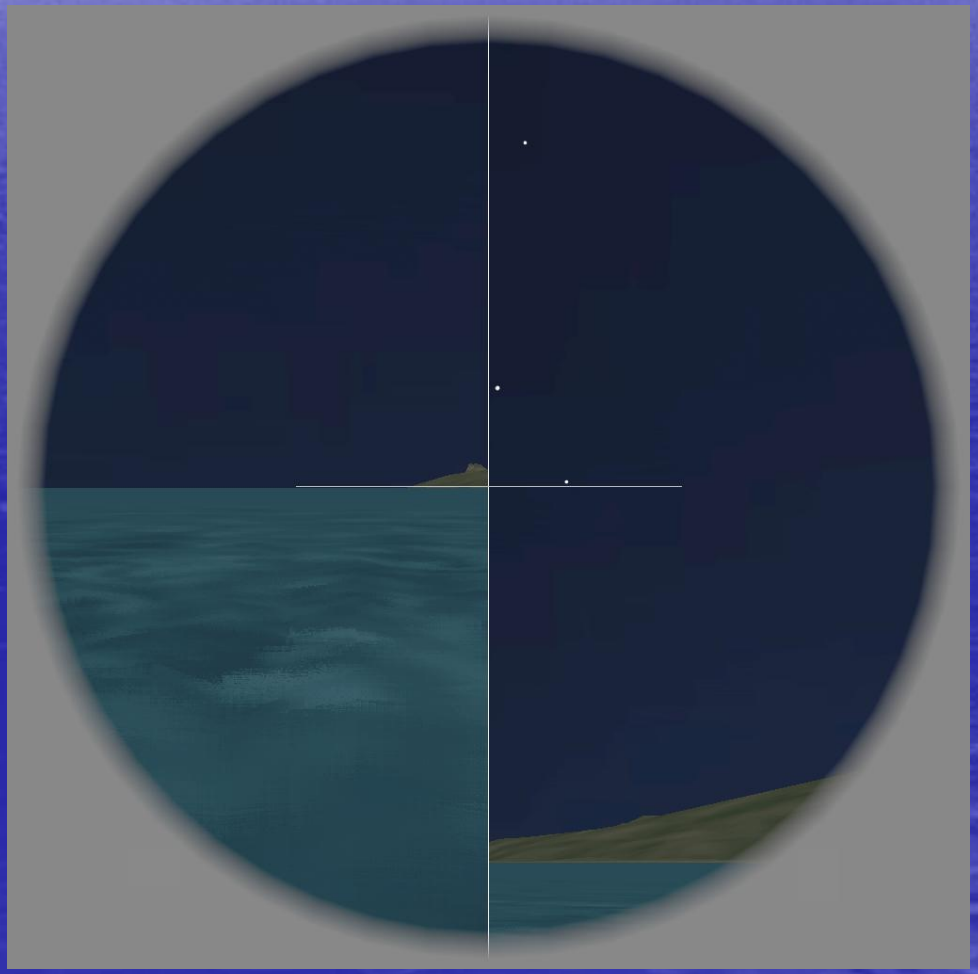


Workplaces of trainees (TW)



On the sextant simulator, a realistic image of the night sky with a display of the Moon and the celestial bodies at a given time and for a given observer position is displayed. The list of celestial bodies corresponds to the Marine Astronomical Yearbook (MAE, published by the Main Department of Navigation and Oceanography of the RF Ministry of Defense). The position of the moon and heavenly bodies in the celestial sphere is calculated for the interval 1970 - 2090.

The astronavigation module allows to obtain the initial data for calculating the observer's observer position using the MAE, TIA or BAC tables (forms Ш8 or Ш8б), by measuring the azimuths and declination of navigational stars



There are three gradations of the angle of observation of the visual pattern:

- ✓ in increments 0.1°;
- ✓ in increments 1°;
- ✓ in increments 10°;

The sextant simulator has two gradations of image magnification:

- ✓ viewing angle 10°;
- ✓ viewing angle 5°;

Types of exercises

Navigation simulator NS-3000 allows you to monitor students for the following types of exercises:

- ✓ exercises of the 1st type - execution of the main types of graphical laying on a paper map, taking into account the impact of external factors (navigation by calculation);
- ✓ exercises of the second type - determination of the ship's position along the landmarks using radar simulators and a visual direction finder;
- ✓ type 3 exercises - path planning, graphical laying under the influence of external factors, location of the vessel along the landmarks using radar simulators, visual direction finder, satellite navigation system (GPS), determination of drift angle and flow elements;

The process of doing exercises

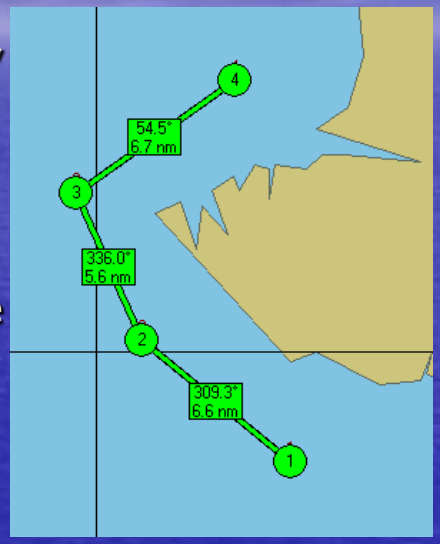
The process of performing exercises consists of the following stages:

- ✓ preparation of the exercise by the instructor - includes the entry of waypoints, editing the parameters of the exercise, saving the formed exercise in a file;
- ✓ formation of a group list based on the general list of trainees, an instruction file with an exercise for each trainee;
- ✓ Exercise of the trainee, input of results, automatic evaluation of the results according to the criteria specified by the instructor;
- ✓ the instructor's analysis of the results obtained on the basis of the report on the performance of the exercise by the trainee;

Editing Waypoints

The procedure for editing waypoints is a common stage for all types of exercises. A given set of waypoints has the following meaning for each type of exercise:

- ✓ exercises of the 1st type (navigation by calculation) - the trainee must calculate for each waypoint the elements of the vessel's movement (course, lag count), or the coordinates of the ship's position by the elements of its movement;
- ✓ exercises of the second type (observational) - in each waypoint the trainee must perform an observation using a radar simulator and a visual direction finder;
- ✓ exercises of the third type (ship wiring) - during the wiring of the vessel the trainee must pass through each specified waypoint;



Editing the list of waypoints is possible both with the help of an electronic map, and in a tabular form. It is possible to automatically check the formed route for the presence of dangerous cartographic objects along the route of the vessel.

Название: Без имени

Отправление: 02.02.2004 2 ч. 48 мин.

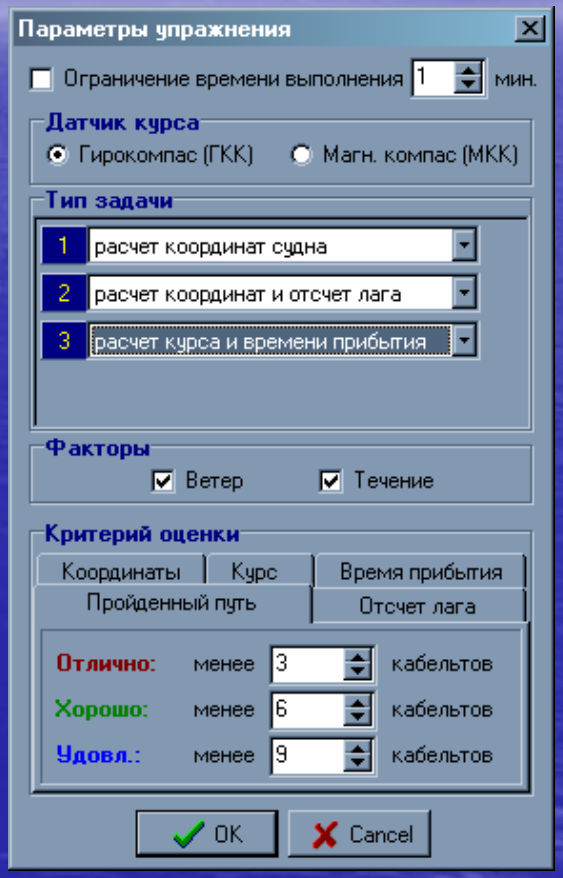
Загрузить | Сохранить | Проверить | Очистить

N	Широта	Долгота	Скорость (уз.)	Курс (град.)	Длина (миль)	Время движения	Время прибытия
1	44°26.180'N	33°29.454'E	5.0	309.3	6.6	01 ч. 19 мин.	
2	44°30.369'N	33°22.293'E	5.0	336.0	5.6	02 ч. 26 мин.	02.02.2004 04 ч. 08 мин.
3	44°35.440'N	33°19.127'E	5.0	54.5	6.7	03 ч. 46 мин.	02.02.2004 05 ч. 14 мин.
4	44°39.325'N	33°26.769'E					02.02.2004 06 ч. 35 мин.

Editing the parameters of exercise type 1

For exercises of the 1st type (swimming in the reckoning), the following parameters can be edited:

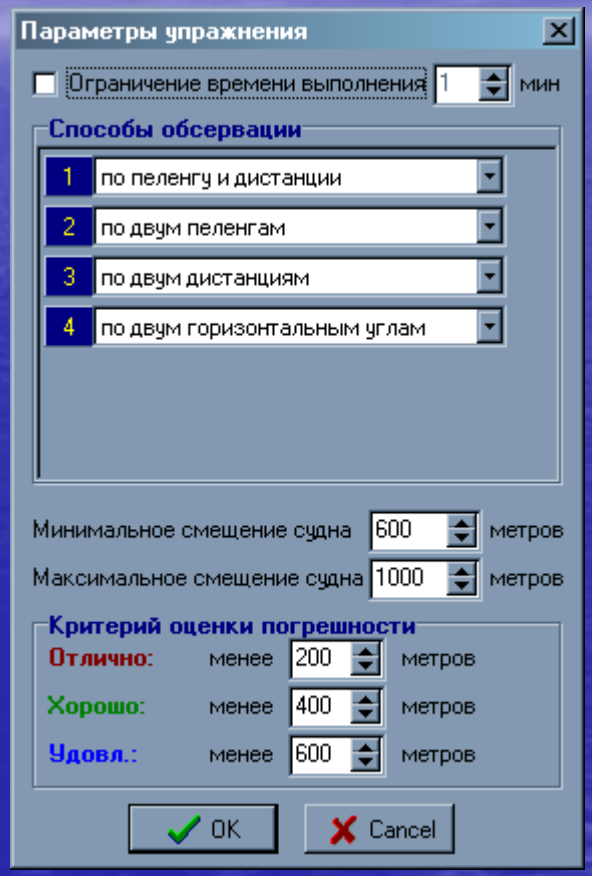
- ✓ Limiting the execution time of the solution of each task;
- ✓ the type of the course sensor is a magnetic compass or gyrocompass, the gyrocompass and lag corrections are randomly generated for each trainee;
- ✓ The type of task to be solved at each waypoint:
  - calculation of the coordinates of the vessel according to known elements of its movement (course and speed), lag and gyro compass corrections are generated automatically by the program for each trainee;
  - the calculation of the coordinates of the vessel and the counting of the lag by known elements of its movement (course and speed), the corrections of the lag and the gyro compass are generated automatically by the program for each trainee;
  - calculating the course and time of arrival at a waypoint with known coordinates at a given time, adjusting the lag and gyro compass are generated automatically by the program for each trainee;
- ✓ presence of external factors (wind and current), direction and speed of wind and current are generated automatically by the program for each trainee;
- ✓ the evaluation criteria for each parameter calculated by the trainee;



Editing the parameters of exercise type 2

For exercises of the 2nd type (observational), the following parameters can be edited:

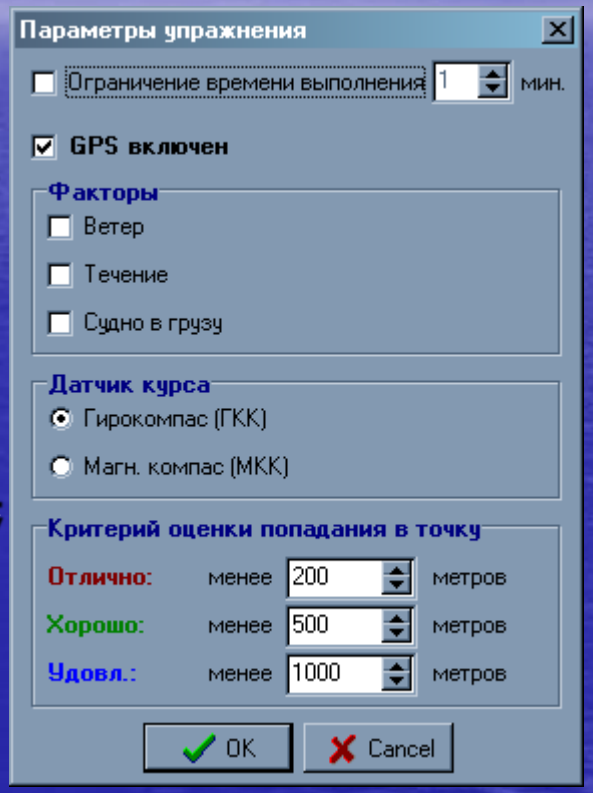
- ✓ Limiting the execution time of the solution of each task;
- ✓ way of performing an observation in each waypoint:
  - bearing and distance;
  - for two bearings;
  - for two distances;
  - for three bearings;
  - on three distances;
  - at two horizontal angles;
- ✓ the minimum and maximum displacement of the position of the vessel, relative to the waypoint - allows the automatic generation of unique tasks for each trainee, by shifting the vessel to specified values in a random direction from the waypoint;
- ✓ the evaluation criteria for each parameter calculated by the trainee;



Editing the parameters of exercise type 3

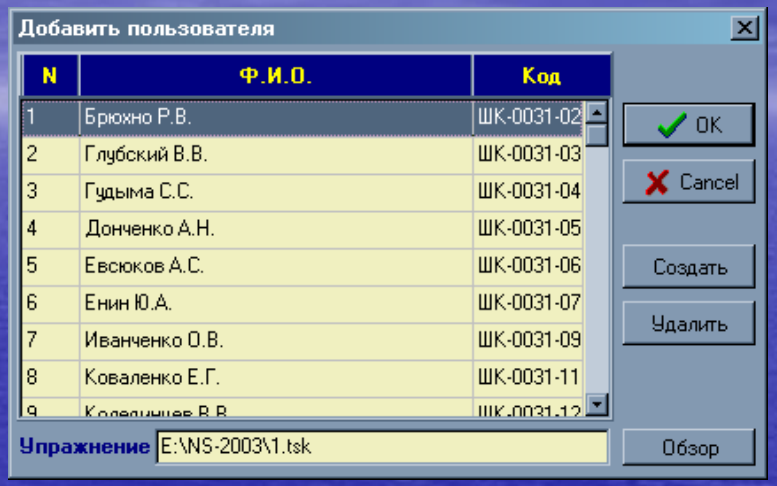
For exercises of the third type (ship wiring), the following parameters can be edited:

- ✓ Limiting the execution time of the solution of each task;
- ✓ availability of GPS;
- ✓ presence of external factors:
  - wind - direction and wind speed are generated randomly for each trainee;
  - current - the direction and velocity of the flow are generated randomly for each trainee ;;
  - a ship in cargo;
- ✓ the type of the course sensor is a magnetic or gyrocompass, the gyrocompass and lag corrections are randomly generated for each trainee;
- ✓ the evaluation criteria for each parameter calculated by the trainee;

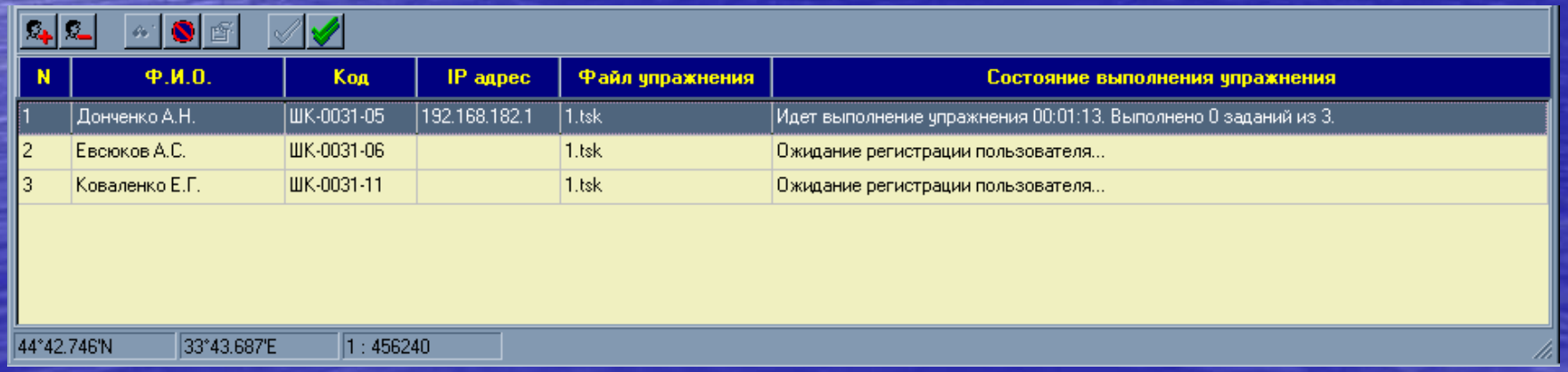


Forming the list of trainees

The instructor's workstation allows you to create a group list, based on the general list of trainees present in the user database. For each trainee, the instructor specifies the file of the previously saved exercise for execution.

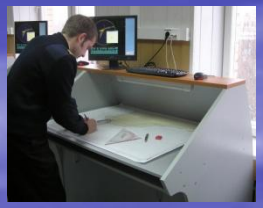


The table with the list of users allows the instructor to quickly monitor the progress of the exercise by each trainee, add users and remove them from the list.



N	Ф.И.О.	Код	IP адрес	Файл упражнения	Состояние выполнения упражнения
1	Донченко А.Н.	ШК-0031-05	192.168.182.1	1.tsk	Идет выполнение упражнения 00:01:13. Выполнено 0 заданий из 3.
2	Евсюков А.С.	ШК-0031-06		1.tsk	Ожидание регистрации пользователя...
3	Коваленко Е.Г.	ШК-0031-11		1.tsk	Ожидание регистрации пользователя...

Performing exercises

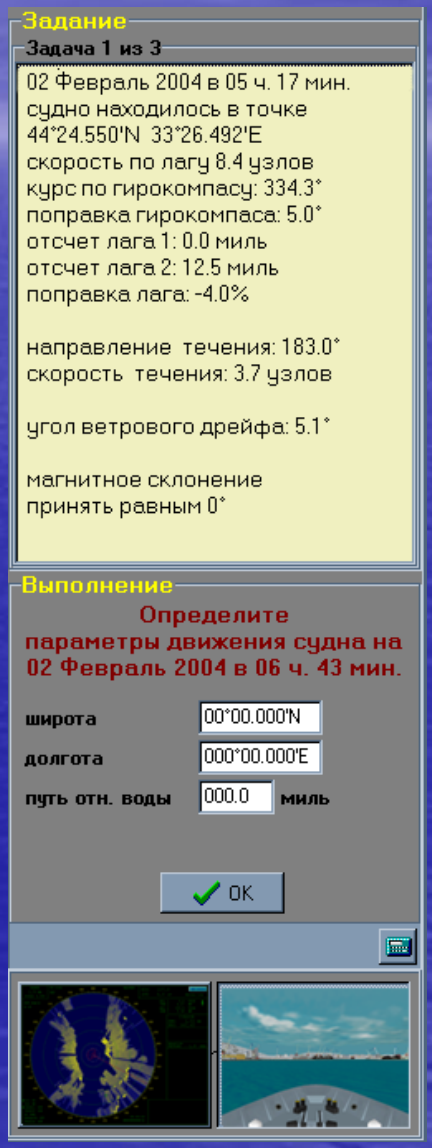


The workstation of the trainee displays exercises in text form, contains the fields of the results input, the button for calling the calculator, the buttons for switching the simulation mode - the simulator of the radar or the visual direction finder.

When you input the results to the trainees, they are transferred to the instructor's workplace, on the basis of which the student is automatically assessed.

During the exercise, the trainee at the instructor's workplace displays information about the progress of the exercise:

- ✓ Exercise time;
- ✓ the number of completed tasks;



Methodical support

With the simulator of the navigation pad, methodological support can be supplied - a set of training tasks for practical exercises on the simulator, designed in the form of laboratory works:

Practical work N1. Graphic gasket without taking into account wind and current.

Practical work N2. Graphic gasket taking into account the wind.

Practical work N3. Graphic gasket taking into account the flow.

Practical work N4. Graphic gasket taking into account wind and current.

Practical work N5. Performing Observations.

Practical work N6. Wiring of the vessel along the route.

Practical work N7. Radar surveillance and gasket.

Practical work N8. Determination of ship speed and lag correction.

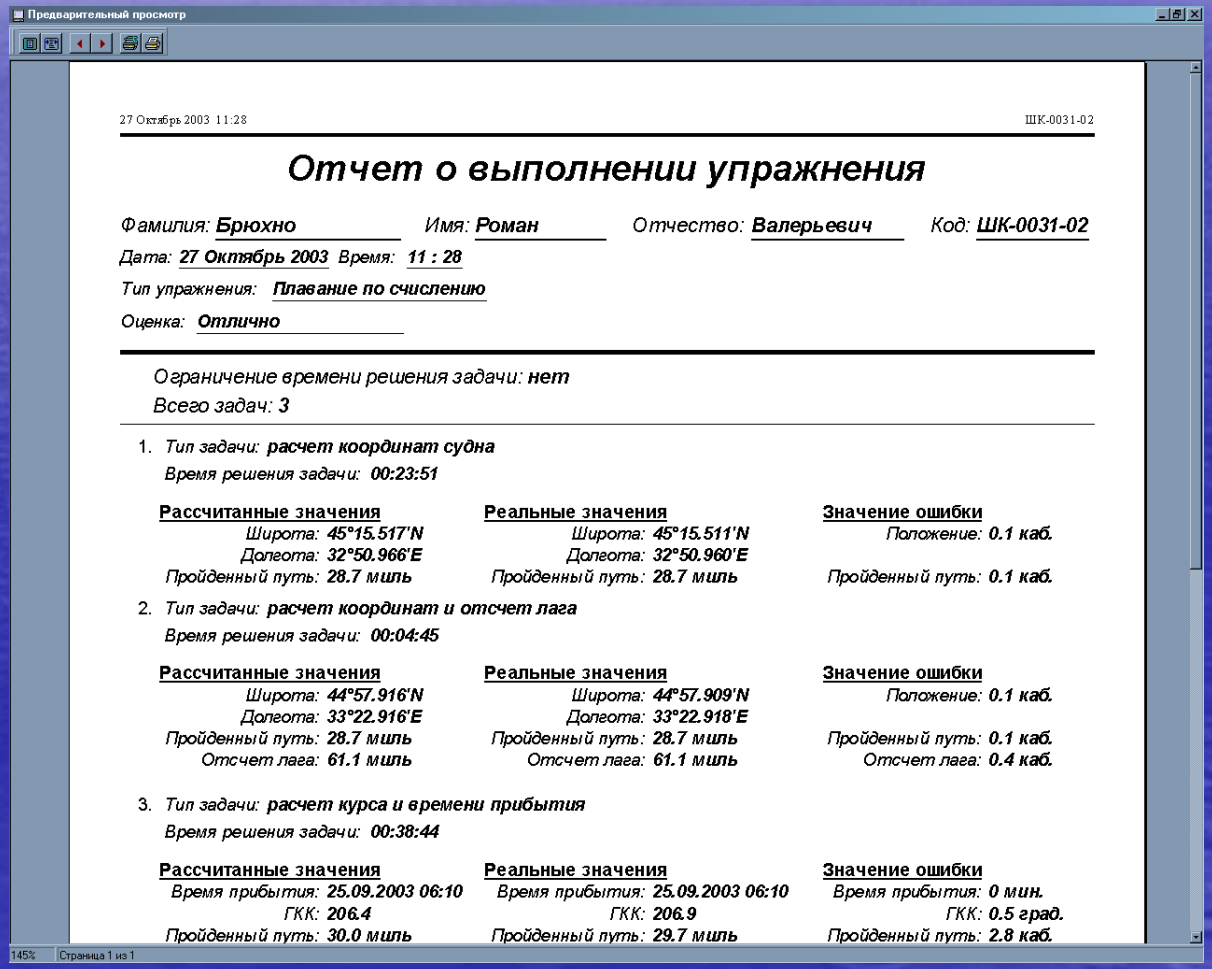
Practical work N9. Determination of gyrocompass correction.

Practical work N10. Selection of maps for the transfer route.

Performing exercises

When all the tasks are completed, the trainee is automatically exposed to an overall rating, displayed in a table form at the instructor's workstation along the list of the entire group. If necessary, the instructor has the opportunity to view and print a detailed report on the process of the exercise on the laser printer.

Information about all the exercises performed is stored in the database and can be analyzed by the instructor in the future.



Предварительный просмотр

27 Октябрь 2003 11:28 ШК-0031-02

Отчет о выполнении упражнения

Фамилия: **Брюхно** Имя: **Роман** Отчество: **Валерьевич** Код: **ШК-0031-02**

Дата: **27 Октябрь 2003** Время: **11 : 28**

Тип упражнения: **Плавание по счислению**

Оценка: **Отлично**

Ограничение времени решения задачи: **нет**

Всего задач: **3**

1. Тип задачи: **расчет координат судна**

   Время решения задачи: **00:23:51**

Рассчитанные значения	Реальные значения	Значение ошибки
Широта: 45°15.517'N	Широта: 45°15.511'N	Положение: 0.1 каб.
Долгота: 32°50.966'E	Долгота: 32°50.960'E	
Пройденный путь: 28.7 миль	Пройденный путь: 28.7 миль	Пройденный путь: 0.1 каб.

2. Тип задачи: **расчет координат и отсчет лага**

   Время решения задачи: **00:04:45**

Рассчитанные значения	Реальные значения	Значение ошибки
Широта: 44°57.916'N	Широта: 44°57.909'N	Положение: 0.1 каб.
Долгота: 33°22.916'E	Долгота: 33°22.918'E	
Пройденный путь: 28.7 миль	Пройденный путь: 28.7 миль	Пройденный путь: 0.1 каб.
Отсчет лага: 61.1 миль	Отсчет лага: 61.1 миль	Отсчет лага: 0.4 каб.

3. Тип задачи: **расчет курса и времени прибытия**

   Время решения задачи: **00:38:44**

Рассчитанные значения	Реальные значения	Значение ошибки
Время прибытия: 25.09.2003 06:10	Время прибытия: 25.09.2003 06:10	Время прибытия: 0 мин.
ГКК: 206.4	ГКК: 206.9	ГКК: 0.5 град.
Пройденный путь: 30.0 миль	Пройденный путь: 29.7 миль	Пройденный путь: 2.8 каб.

145% Страница 1 из 1

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