IALA GUIDELINES
ON
DESIGNING AND IMPLEMENTING SIMULATION IN VTS TRAINING
AT
TRAINING INSTITUTES
AND
VTS CENTRES

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CONTENTS

Guidelines for designing and implementing simulation in VTS training

1.   Introduction

The need for consistent, quality training of Vessel Traffic Service (VTS) operating personnel is of primary importance in ensuring the effectiveness of the service provided. A commitment to training results in professional, reliable services being offered which leads to confidence in, and support for, the service.

Simulation has long been used as a safe and effective means of providing realistic training to ship based personnel. The use of simulation to complement other training methods for VTS personnel is, therefore, a logical step and a recommended course of action.

However, in order to take full advantage of this tool, an approach should be chosen that allows for relevant, effective training in a reasonable time period and any existing training programme needs to be carefully scrutinised and amended in conformity with the new approach.

Simulation also provides a means for evaluating VTS personnel; however the methods used must meet recognised evaluation criteria. Training organisations face many challenges as they integrate simulation tools into their training and these guidelines are intended to assist VTS authorities and training institutes in developing simulation training and evaluation tools and to provide understanding of the instructional techniques to be used with simulation training.

IALA Recommendation V-103, Standards for Training and Certification of VTS Personnel (IALA V-103), defines Simulated Training as:

"the simulation of operational events, practices and procedures to assess the ability of candidates to demonstrate their levels of competence."

The qualifications of Instructors conducting VTS training is noted in section 5.7 of IALA V-103:

"Competent Authorities should ensure that instructors and assessors are appropriately qualified and experienced for the particular training and assessment of competence for which they are given responsibility. Instructors for basic and on-the-job training should hold suitable professional and academic qualifications."

Instructor qualifications are further defined in Model Courses V-103/1, V-103/2 and V-103/3 as follows:

"Any person conducting training of personnel qualifying for certification as VTS Operators should:

- *have an appreciation of the training programme and an understanding of the specific training objectives for the particular type of training being conducted;*
- *be professionally and academically qualified in the task for which training is being conducted;*
- *have an appropriate balance of professional and teaching qualifications;*
- *if conducting training with the use of a simulator:*
    - *have received appropriate guidance in instructional techniques involving the use of simulators; and,*
    - *have gained practical operational experience on the particular simulator being used."*

2. Principles

2.1 VTS Simulator

A VTS Simulator is a tool that is capable of creating realistic operational events, practices and procedures in order to improve and/or assess the skills and abilities of personnel with a view to demonstrating their levels of competence.

It should provide an interface through which personnel can interact with the equipment, the simulated environment and as appropriate, the instructor.

It should permit an instructor to control, monitor and record exercises for effective de-briefing.

Simulation may be conducted by using one or more of the following techniques:

- Paper based- such as drawings, models, traffic charts, etc;
- Communications based simulator – such as verbal, face-to-face, telephone, VHF and/or electronic communications, etc;
- Computer or internet based simulator – such as the creation of realistic situations derived from the use of mathematical models;
- Radar based simulator – such as the use of digitally recorded data together with realistic vessel traffic movements;
- Full-mission VTS simulator – comprising most of the above being interfaced with a simulated ship's bridge environment.

2.2 Benefits of VTS simulation training

Benefits are gained through the achievement and enhancement of the equipment operation, procedural knowledge, reactive capabilities and responses in emergency situations.

In this respect, personnel can achieve the practical skills, knowledge and competence necessary to operate in a professional manner without every possible situation having been experienced in actual daily operations.

2.3 Levels of simulation training

The level of simulation training selected is dependent on the tasks being performed by personnel and the supporting knowledge, skills and abilities necessary to perform those tasks. The levels of simulation training that could be employed range from simulation of individual tasks to full mission simulation that create any or all tasks performed in the VTS. Different methods of simulation could be applied to teaching or evaluating performance on any individual task. Some Training Institutes might use a full VTS mission simulator to teach all modules in the relevant IALA model course. Individual VTS Centres might elect to use simulation techniques that are appropriate to the particular tasks their operators perform and is within the limits of the available resources.

2.4 Realism in VTS simulation

2.4.1 VTS simulation should provide sufficient behavioural realism to allow personnel to acquire skills appropriate to the training objectives.

2.4.2 VTS simulation can also be augmented with equipment to enhance realism and provide experience of the operating capabilities of the VTS equipment concerned. The level of physical realism

should be appropriate to training objectives and include the capabilities, limitations and possible errors of such equipment.

2.4.3 To achieve realism in simulation, the following should be considered:

- The working environment of the simulated VTS Centre should, as far as practicable, be similar to a VTS Operator position in an actual VTS centre that the trainee is expected to work in on completion of training;

- In general, the working environment should include all equipment that is deemed necessary and applicable to a VTS Centre in order to fulfil the demands and requirements of VTS simulation. Such equipment may typically comprise of land-line telephones, VHF, traffic image displays, environmental, meteorological and hydrological sensors, logging and replay equipment, monitoring systems and electronic data systems;

- In order to achieve the most realistic effect in VTS simulation, exercises should be as similar as possible to real events experienced in a VTS environment. Information regarding the creation of exercises can be found in Annexes 1 and 2 of this document;

- Role-play is a major aspect of a set exercise and should be undertaken by Instructors and trainees.

2.5   Documentation

A Training Management System (TMS)[1] that includes thorough documentation of procedures should be in place to ensure that the aims of training programmes are being met. Training records are important for personnel management and to document competency. Documentation is also important for accountability, liability, and other legal implications. Records should be kept of all simulator training conducted that include the participants in the simulation, its duration and results.

The documentation process should include an evaluation of the TMS to verify that the training is based on IALA Recommendation V-103 together with the appropriate model course. There should then be an audit to verify that the training complies with the documented TMS.

2.6   Assessment

Assessment is a fundamental part of the simulation process. If simulation is used to assess a person's competence, the following five levels should be applied to indicate the learning level attained. An average level of 3 to 4 from the table below should be considered satisfactory. Section 5 of IALA Model course V-103/1 contains further details.

LEVEL	CATEGORY	DESCRIPTION
1	Receiving	The trainee's willingness to participate in the learning activities.
2	Responding	The trainee's active participation in the learning activity.
3	Significance	The worth that the trainee attaches to a particular object, phenomena or behaviour.
4	Organisation	The trainee's ability in bringing together different values, resolving conflicts between them and beginning the building of an internally consistent value system.
5	Value Complex	The value system that has been achieved due to contrary, consistent and predictable behaviour for a sufficiently long time for the trainee to have developed a characteristic life-style.

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[1] More information on TMS is given in IALA Guidelines for the Accreditation of VTS Training Institutes.

3. Planning simulation exercises

The fundamental input requirements for planning a simulation exercise are the Training Objectives.

- The training objectives for simulation exercises at Training Institutes are discussed in Annex 1.
- The training objectives for simulation exercises at VTS Centres are discussed in Annex 2.

The development of simulation exercises from the training objectives is a complicated matter that can usefully be divided into several phases, as shown in Figure 1.
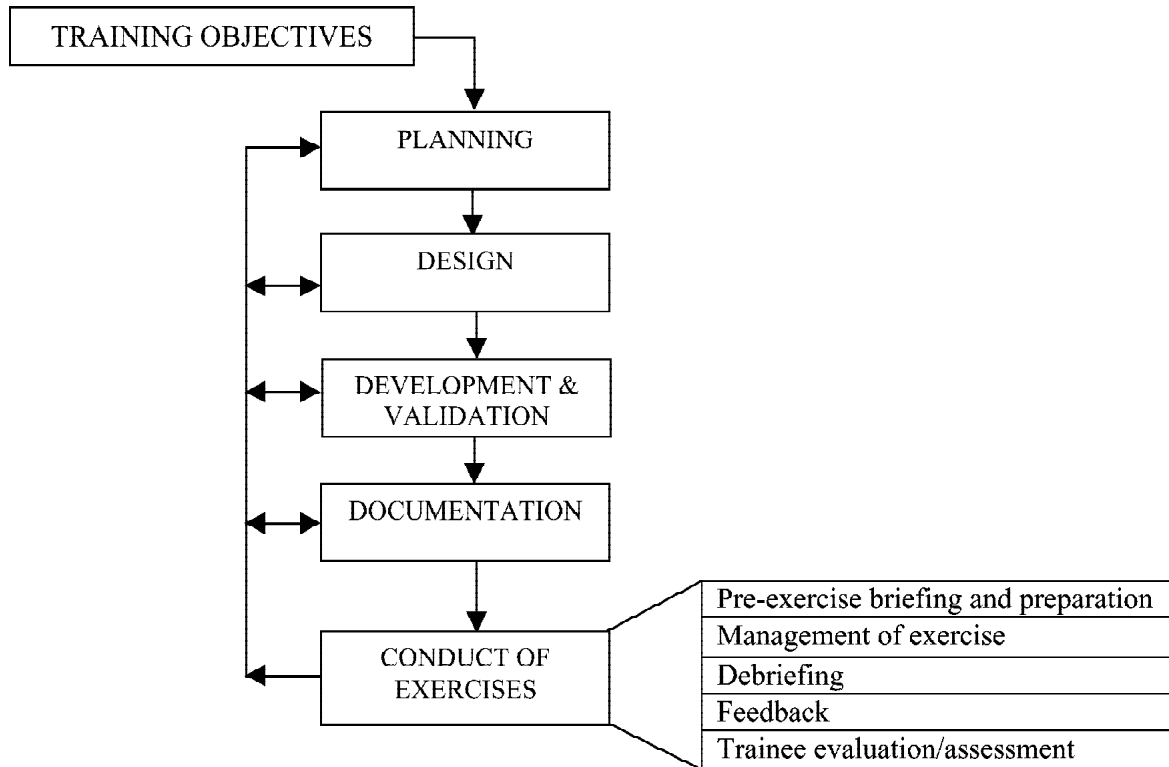
Fig. 1: Phases of the development of a simulation exercise

When developing simulation exercises, consideration should at all stages be given to:

- The prior knowledge and experience of trainees;
- Limitations of equipment and resources (including Staff/Student Ratio).

4. Design of simulation exercises

A simulation exercise should be designed with the intention of delivering a specific learning outcome to trainees.

All of the following aspects that relate to the specific learning outcome should be incorporated in the design of a simulation exercise. Additional aspects that are pertinent to the specific learning outcome should also be included in the exercise design.

4.1   Selection of exercise Area (real and/or a fictitious sea area or waterway created for the purpose of training and assessment)[2] :

- Coastal (including Ship Routeing and/or Traffic Separation Schemes);
- Estuary;
- Port;
- Inland Waterways;
- Relevant International, National and Local Regulations and Bylaws;
- Geographic limitations of the exercise area;
- Typical traffic patterns appropriate to the exercise area.

4.2   Vessel Types (Real and/or generic). Where practicable, vessel types based on a data base of vessels that actually use the area would be advantageous:

- Loaded/Ballast;
- Hazardous/Non Hazardous cargoes;
- High Speed craft.

4.3   Environmental Conditions and its influences on the VTS equipment and traffic image:

- Meteorological;
- Tidal;
- Time.

4.4   State of the sea area:

- Buoys;
- Lights;
- Areas of Closure.

4.5   Allied Services:

- SAR;
- Ship Safety;
- Pilotage;
- Tugs;
- Agents;
- Customs.

4.6   Other resources to be utilised including Publications and Simulator Facilities.

5.   Development and validation of simulation exercises

Realistic outcomes are crucial to achieve the desired exercise-specific training objectives. An exercise should consist of a series of "events" intended to identify, or high-light, the specific learning outcome for which the exercise has been designed. An "event" is an incident or circumstance that is intended to stimulate trainee reaction and can be activated by trainee observation or by communication.

Events can be classified into the following categories by the response generated:

Significant	or	Minor or Background;
Interactive	or	Non interactive;
Individual	or	Teamwork and joint response.

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[2] The exercise area for simulation exercises at a VTS Centre should be the appropriate part of the VTS area concerned.

The sequence of events should take into consideration:
> The workload of both trainees and Instructors;
> The increasing level of complexity caused by the event or sequence of events.

The level of activity should achieve the objectives and reflect the stage of training.

On completion of the design and development of an exercise it should be validated by persons with considerable VTS operational experience before being used for training purposes.

6.   Documentation for simulation exercises

The following documents should be prepared prior to any exercise being undertaken:

- General information and scene setting
- Instructor information/script
- Trainee information/script
- Technical information/script

The documents should relate to the selected exercise area (see §3.1) as closely as possible and a standard format for each type of document should be used within a Training Institute or VTS Centre.

7.   Conduct of simulation exercises

Exercises should be conducted in real time and, where practicable, in such a manner that an operational VTS environment is created.

7.1   Pre-exercise briefing and preparation

During the pre-exercise briefing Instructors should provide participants with all relevant documentation, including those that give general information and set the scene as well as the trainees information/script document.

It is important the following issues are covered during the pre-exercise briefing:

- Team disposition/roles/equipment status;
- Overall aim – (type of exercise: familiarization/training/assessment);
- Relevant objectives;
- Broad setting (where, when, environment);
- Detailed setting (traffic list, start positions);
- Communication scenario;
- Length of exercise, intended conduct of exercise.

When setting up a simulation exercise it is important for Instructors to:

- Ensure all preparations are complete;
- Allow adequate time for planning and preparation;
- Ensure adequate provision of response cells (instructors and /or students simulating ships, communications, agents or other exercise players.);
- Check recording and monitoring equipment.

7.2   Management of exercises

During the exercise attention should be given to the following matters:

- Work to the script and incident plan;
- Record comments or unscripted additions for exercise review;
- Make notes of key teaching points for debriefing;
- Make notes on individuals for student evaluation;
- Review pace and progress of the exercise dependent on student performance;
- Avoid interrupting participants during the exercise. However, if a problem arises that affects the continuity of the exercise; the Instructor should consider whether the exercise should be paused or discontinued;
- Consider aim of exercise – for training, identify teaching points; for assessment, ensure performance against objectives.

Instructors should also observe the overall participation of trainees in the exercise, where appropriate their contribution to the work of the team, their reaction time and their response to stressful situations.

7.3   Debriefing

Debriefing is as important as the exercise itself and should be carried out by an Instructor immediately after each exercise. The exercise should be discussed fully with outcomes and lessons to be learned from them. The Instructor should ensure that the objectives set out for the exercise have been met and encourage trainees to provide feedback on the content of the exercise, the instructions given and the effectiveness of the simulation.

The following points are particularly relevant to debriefing sessions:

- Debriefing should be properly controlled and co-ordinated;
- Consider appropriate location and conduct of debriefing;
- Allow time to prepare debriefing:
    - Identity teaching points and order of presentation;
    - Prepare exercise playback;
- Ensure a focus on key outcomes that should be learned from the exercise:
    - Try to take one point at a time;
    - Emphasise the good points;
- Ensure student participation/involvement;
- Record key points from debriefing for exercise review and trainee assessment;
- Sum up and check performance against objectives.

7.4   Feedback

It is important that simulation exercises provide training that achieves the required learning outcome. To ensure this requirement is met a system of feedback, which includes some or all of the following, should be employed:

- Reviewing exercise performance against required learning outcomes using instructor notes and debrief comments;
- Encouraging visits by customers and practitioners to witness and assess exercise and debriefing. However, care should be taken to avoid any interference or interruption being caused to an exercise or its participants;
- Reviewing requirement for equipment modifications to meet training objectives;

- Reviewing continuing suitability of equipment to meet advances in technology –visits to VTS centres should be encouraged;
- Considering any formal written feedback.

Appropriate documentation/exercise script should be amended to incorporate changes that result from an analysis of the feedback information which will improve the effectiveness of the exercise.

7.5   Trainee evaluation/assessment

The achievement of trainees against the exercise objectives should be evaluated on completion of the exercise and the result recorded.

The evaluation of trainees at VTS Centres should be undertaken only by qualified VTS Supervisors or qualified On-the-Job Instructors and the result recorded in OJT Task Books (See Model Course V-103/ 4).

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Annex 1 - Simulation at VTS Training Institutes

1.   Introduction

The use of simulation at VTS Training Institutes can assist in achieving the levels of competence set by IALA, Competent Authorities and VTS Authorities for Basic and Advancement training in an effective and timely manner.

Simulation facilities and techniques can also be used at VTS Training Institutes for:

- Demonstrations;
- Familiarisation of trainees with facilities and equipment similar to those at VTS Centres;
- Basic Procedures and Skills;
- Emergencies;
- Advanced Procedures and Skills;
- Evaluation and assessment of the prior learning of candidate VTS Operators;
- Evaluation or Assessment of the progress of trainees.

Simulation should be planned and conducted by Instructors with appropriate training on the use of simulators and, preferably, with experience in VTS operations and activities.

2.   Training objectives

To be effective, simulation training at VTS Training Institutes must be realistic, well planned and have clearly stated training objectives.

These objectives should include the need for trainees to obtain the minimum levels of competence set out in the modules and overview of the appropriate model course. Although these levels of competence can be achieved by different teaching methods, some are best suited to simulation and where this is the case, the specific training objectives must be reflected at all phases of development of a simulation exercise.

The model courses are sub-divided into training modules, each containing a specific topic or subject. Each training module is further sub-divided into "subject areas" that identify the skills, knowledge and level of competence required for the particular subject area and should be used as the basis of developing exercise specific training objectives (see Figure 2).
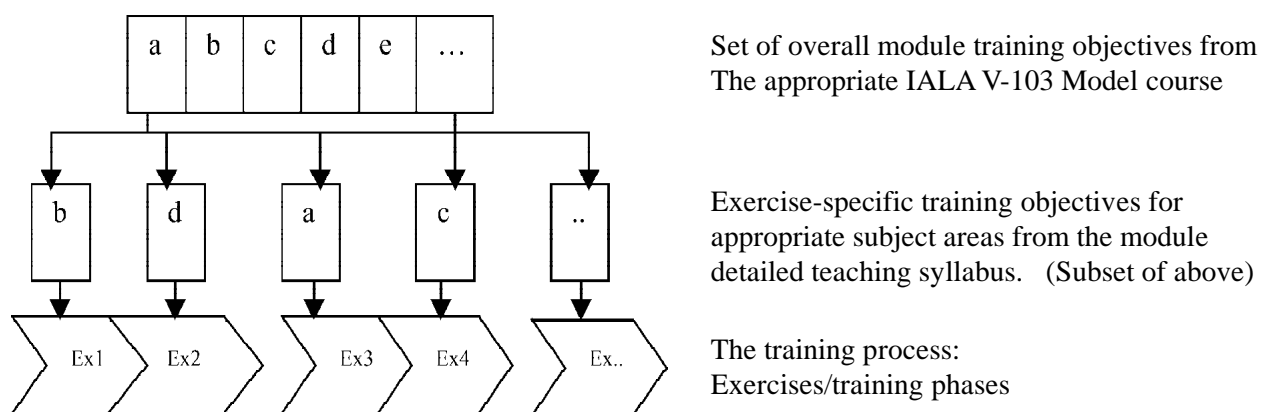

Fig. 2: Overall and exercise specific training objectives and their relation to the training process and its phases.

However, training objectives should also be prepared for simulation training that integrates the skills and knowledge acquired from the individual modules. When these training objectives are being developed, the following extract from Model Course V-103/1, VTS Operator Basic Training should be taken into consideration:

"Practical training

In addition to subject modules; the following are recommended simulated exercises

Subject	Assessment criteria	Duration in hours
Basic skills • Monitoring and identification • Communication co-ordination • Evaluation and interpretation of the traffic situation • Log keeping, recording and reporting	Ability to identify, correctly interpret and handle reports from five simulated vessels	20
Traffic interaction and conflict resolution • Waterway management in multi-ship scenarios • Anticipation and projection of traffic patterns, • Critical areas • Vessels overtaking and approaching each other • VTS sailing plans, including those for deep draught vessels	Ability to identify, correctly interpret and deal with up to five simulated vessels in complex situations. Ability to prepare VTS sailing plans, to monitor their execution and amend them due to unforeseen circumstances	60
Emergencies and special situations • Contingency plans • Adverse weather conditions • Special vessels and those with restricted manoeuvrability • Internal and external emergencies	Ability to identify, correctly interpret data and handle reports from 20 simulated vessels during emergencies and special situations	20

Recommended overall exercises"

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Annex 2 - Simulation at VTS Centres

1. Introduction

The use of simulation at VTS Centres can assist in achieving the standards set by IALA, Competent Authorities and VTS Authorities for On-Job-Training in an effective and timely manner. Simulation also provides a safe working environment for trainees to demonstrate competency in procedures and equipment through learning from their own experience gained during simulation exercises as well as the experience of qualified VTS Operators gained in operational circumstances and used as the basis for the simulation exercises.

Simulation training can be provided at VTS Centres in several ways. One being to provide a simulator at the Centre (computer based training or CBT) and another being to make use of the emerging technology of e-learning (web based training or WBT). WBT can be implemented by means of an internet connection with a training simulator located at, or operated by, an Accredited Training Institute. Other developing or emerging technologies, such as inter-active CD ROMs also demonstrate the potential of being suitable for some or all elements of simulation training at VTS Centres.

Simulation can also be used at VTS Centres for purposes other that OJT, including:
- Improving communication skills;
- Identifying the need to change operational practices and procedures;
- Testing and evaluating new operational practices and procedures;
- Revalidation of VTS Operator Certificates (see IALA V-103 §5.6);
- Annual assessments of VTS Personnel (see IALA V-103 §5.5);
- Maintaining proficiency with emergency procedures;
- Operational interaction with adjacent VTS centres.

Simulation should be planned and conducted by VTS Personnel with appropriate training on the use of simulators and, preferably, qualified On-the-Job Instructors.

2. Training objectives

To be effective, simulation training at VTS Centres must be realistic, well planned and have clearly stated training objectives.

These objectives should include providing thorough knowledge of the:
- VTS area concerned, including any sub-areas, location and quantity of sensor equipment, geographical, topographical and environmental limitations and constraints, the hydrographical and meteorological conditions and the aids to navigation, traffic routeing schemes and ship reporting systems that are wholly or partially within the area;
- International, national, regional, local laws, harbour byelaws and regulations as they affect the operations of the VTS Centre;
- Vessel traffic using the area, including the types and sizes of vessel and their daily and seasonal traffic patterns;
- Theory and procedures of traffic management in the VTS area concerned and the skill to implement the procedures;
- Operation of all operational equipment fitted at or operated by the VTS Centre and the skill to use the equipment.

The objectives may also include providing knowledge of the:

- Areas of responsibility and management of the VTS Centre;

- Methods of liasing with adjacent and neighbouring VTS Areas, nationally and where appropriate, internationally and the skill to employ those methods.

Learning takes place in distinct steps and the training objectives set out above will, in most cases, need to be split into sub-sets of exercise-specific training aims.

The required learning outcome of each exercise-specific training aim should be clear and concisely planned; they may be focussed on such matters as:

- Individual performance;

- Assessment of competency in the use of equipment and procedures;

- Demonstrating an understanding of the theory of knowledge based subjects;

- Operational team work and the development of team building within the VTS Centre and with allied services;

- Identification of traffic management measures;

- The development of new or revised operational routines, and their common interpretation leading to standard operating procedures.

3.   Selection of simulation tools

The simulation tools that are appropriate for the tasks being performed and the service options being provided by the VTS Centre should be selected.   The tasks to be performed are those relevant to the VTS Centre concerned that are included within the training modules of the appropriate IALA Model Course.   The services that may be provided by VTS are set out in IMO Resolution A.857(20) and are discussed in detail in the IALA VTS Manual.   They comprise the following:

- **Information Service**, which is the provision of essential information to VTS users. It may concern the positions, identity or intentions of vessels; amendments or changes to promulgated information; meteorological and hydrological information or any condition that affects the flow of traffic in the port.

- **Navigation Assistance Service**, which is a service to assist the navigation decision making process on board the vessel and to monitor the effects. In delivering this service, the VTS may provide a vessel with its course or speed made good, its position relative to the fairway axis or way-points, the range and bearing to aids to navigation or landmarks or with specific warnings. Navigation assistance is typically only given at the request of the vessel. However, it may be given if deemed necessary by the VTS and if positive identification of the vessel concerned has been established.

- **Traffic Organisation Service**, which is a service to prevent the development of dangerous situations or to provide for the efficient movement of traffic through constricted areas or under difficult circumstances. Traffic organisation concerns the forward planning of vessel movements and is particularly relevant during times of congestion or when the movement of special transports disrupts the normal flow of traffic. The service may include establishing and operating a system of traffic clearances, the allocation of space, establishing speed limits or routes to be followed or enforcing adherence to governing rules.

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