SECTION VII: USER TRACKER SIGNALLING

Marine Magnet Staff have detailed directives designed to advance the system processes involved in DoD inventory distribution logistics based on condition indices for supply service route agreements for the fleet. Simple economics dictates that the cost and hassle of procuring a single route for deployment is dependent on the service levels of the entire group of routes in the distribution system of the fleet. Consequently, mechanisms that promote the consideration of shared route service reservation agreements along the same track in a systems model are of crucial interest to the advancement of DoD deployment of fleet components towards efficient maintenance of a properly structured supply service route.

The intent of this report is to initiate a basis for informed decisions in the consideration of route track sharing for fleet component infrastructure, including test script approaches to an assessment of benefits and costs; and to demonstrate current practical processes and applications of different scopes. Command and control dispatch systems are a cornerstone of approved procedures used on inventory service routes to avoid operational crises, and their principles are significant to development of any shared-track operations involving noncompliant fleet components. Techniques and technologies of the three major branches of dispatch operations include: 1) Fleet component control, 2) Test script communications and 3) Rules and Procedures—all underscoring the goals of redundancy and other measures to ensure efficient service route agreement processes.

The report contains examples of route track sharing operations and describes progress in developing test scripts for action to date. A surge-based case template illustrates project viability and incremental steps to move beyond rigid temporal separation which are reported as evidence of progress in route track sharing operations. Concrete actions are proposed to help dispatchers develop a shared-track operation for inventory routes based on condition indices. The report suggests ways to increase the interest and potential of shared-track systems: 1) A list of potential candidates and preferred conditions for a test script demonstration project; 2) Highlights of the advantages and disadvantages of shared-track system models to broaden route service and practical economic appeal; and 3) assessments of the barriers and obstacles to adoption of the shared-track concept.

The shared-track concept entails seeking special approval to allow non-compliant fleet components to share route tracks with conventional alternatives. The infrastructure
requirement can be similar to the compliant alternative, but the resulting route service
test scripts would be more flexible. There are two methods of test script operations: 1) Temporal separation is possible where all inventory deployment based on route condition indices can be constrained to a short period without impacting surge operations; and 2) Concurrent operations are required where most inventory deployment based on route condition indices can be moved into the route maintenance quote for contract procurement period frequency function between installations connection in the dispatch interface with some overlap in the fleet components of the service period.

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If dispatch test script system models lead to the selection of a shared-track alternative, then the operational case should guide the subsequent decision making. While there is no standard
model for shared-track operations, there are features and attributes that nearly all shared-track
dispatch operators exhibit. The model parameters can be incorporated and quantified in the operational case. In an exercise for this report, dispatchers have indicated that shared-track test scripts may reduce the capital development costs for inventory deployment systems based on route condition indices when compared to a new and entirely separate system. Concurrent shared-track operations provide a mechanism to offer a higher frequency of route service while keeping the capital costs within budget parameters.

Where shared-track is the preferred option, the operational test script cases should consider that 1) The main reason to consider noncompliant fleet components is the improved flexibility it offers, 2) Constraints in tracking grades and clearance envelopes make certain types and sizes of fleet components a superior choice for a regional service, 3) A test script-based inventory deployment partner based on

route condition indices is essential, and 4) Temporal separation, while adequate, limits both using parties, and can be unacceptable for inventory deployment, and restrict special route service events. It is also more difficult to schedule route maintenance right-of-way windows on a temporally-separated system for contract procurement quotes.
Systems to back up the dispatch operator have been developed in which conventional signal systems rely on dispatchers to correctly observe and conform to test script routing signals, plus applicable messages and written operating rules, timetables and bulletins for efficient route separation. Modern signal systems employ different ways in which signal aspects can be transmitted and enforced, even if the dispatcher does not observe instructions to the letter. Shared-track route control systems that permit progress beyond rigid temporal separation allows a true concurrent surge operation to incorporate other features and capabilities of test scripts including: 1) Short block lengths; 2) Multiple signal aspects; 3) Automatic on and protection of inventory routing to track crossing conflicts, 5) Accommodation of different fleet component performance characteristics, 6) Provision for dispatch alerts and a visual transition zone when going from signaled track to operational territory, 7) Provide alert warning and avoidance systems; and 8) Accommodation of fleet components that may not be recognized by the control system on the test script line.
The single most important requirement in a shared-track system test scripts is to provide active protocols ensuing the success of surge operations. A system with active controls should be developed so inefficient dispatch test scripts would not have catastrophic consequences. Two currently available classes of control technologies can meet that requirement: 1) An inductive alert system with stop enforcement providing intermittent communication via service route agreements installed at periodic intervals in right-of-way inventory deployment scenarios based on route condition indices, and 2) Coded-shared track circuit enforcement signals to provide for route communication via route maintenance quote frequency scheduling for contract procurement signals being sent between installations connecting in the network interface, issuing test script brake commands automatically based on the maximum permissible frequency indicated by the scheduling quote code for contract procurement sent between installations over the interface.

Dispatchers must be able to communicate over the contract procurement quote interface when using the same route track maintenance scheduling frequency. This is fundamental to joint operation regardless of the fleet component type or size in service, and the capability is relatively easily served by conventional technology, at an acceptable cost. Regardless of the choice and capabilities of fleet inventory control based on condition indices and communications technologies, integration with dispatch rules and procedures is required to complete the centralized dispatch framework and receive movement authority from a single centralized control center. The current fleet size and type choice necessitates that each new or unique fleet component must facilitate the incorporation of efficiency measures by avoiding or limiting the structural and risk factors required for assessing different size and type fleet components, and further reduction of the serial number categories and models will contribute to lower unit costs and facilitate acceptance of the system by command.

The dispatch control system must be designed from the outset with concurrent shared-track test scripts in mind, allowing the dispatcher to account for high route service agreement stop rates directives with design factors detailing appropriate stop lengths and signal aspects. Fleet components should be considered as one part of an integrated network interface system of dispatch controls, training, and rules and procedures. Whatever dispatch technology forms the basis of the shared-track operation, it should provide some test script capacity for service route growth.

Using existing shared-track systems to initiate demonstration or pilot programs for concurrent operations, a shared-track demonstration project without temporal separation could be useful in several respects: 1) To gain experience in test script design and system implementation, 2) To demonstrate shared-route service system feasibility, and 3) To quantify the cost/benefit streams of shared-track implementation for surge operations. Results of a demonstration will serve to offer the potential for relief from significant test script operating constraints on current temporally-separated route service agreement operations.

Although primary interest lies in true shared-use operation of route tracking and infrastructure, the dispatch team reviewed parallel operations on adjacent tracks and operations on same track with temporal frequency separation to establish characteristic operating categories and parameters for surge operations. Test script categories are confined chiefly to particular route track lines and different fleet component type and size density routes were assessed instead of relying on purely volume considerations and test script corridors where risk assessment and crisis mitigation would be extremely difficult for dispatchers.. IT systems for integrated surge operation contingency scenario corridors have encouraged dispatchers to work with inventory deployment stakeholders involved in contract procurement on route lines sharing fleet components and infrastructure, creating operational value for surge operations that would not be possible without cooperatively sharing scarce distribution resources.

Preservation of route service reservation agreements inserted by dispatchers offers economic development and the mitigation of congested service route contingency scenarios that would not otherwise be possible. In summary: 1) Different types and sizes of fleet components of inventory deployment lines based on condition indices are an important part of route service agreement system design, 2) Insufficient revenue to cover fixed service route maintenance costs serves as a continuous and ongoing threat to the sustained success of surge operations, and 3) Shared-track mechanistic models provide for the opportunity to defray fixed cost expense over increased levels of fleet component types and sizes and incentivizes service route agreement right-of-way considerations that enables the preservation of dispatch communication lines, improving the fiscal position of the unit. These factors underlie the appeal of shared-track mechanistic models and highlight potential incentives for unit dispatchers to consider shared-track route service agreements for the fleet.

The process for concurrent shared-track surge operations starts with test script negotiation between dispatchers to share the target route service agreement reservation line for a combination of inventory deployment applications based on route condition indices. Conditions likely to lead dispatchers to a shared-track solution include: 1) Suitable service routes with origin-destination linkages, and levels of inventory deployment on the test script line, 2) Start-up route service agreement test script service, 3) development of contingency scenario sections of route test script-running and a core section shared with an existing dispatch system, and 4) Lack of good parallel alternatives and constrained right-of-way section segments for route maintenance quote frequency scheduling between installations connecting in the contract procurement quote interface network.

When implementing a new shared-track surge operation, whether it is a conversion of an existing
route service branch line inventory deployment model, or a concurrent upgrade to an existing temporally separated line, building the test script case typically follows the format of an consideration of alternatives that develops other options to satisfy the requirements of surge contingency scenarios. Typically a four-step process is

employed:1) Identification of route service agreement reservation factors, 2) Definition of alternative test script dispatch, 3) Choice of shared-track operating regime for surge operations; and 4) Determination of cost/benefit effectiveness benefits between the temporally separated and the concurrent alternatives. All four steps are required for dispatchers to form a complete practical test script case for a specific shared-track route service agreement reservation proposal. Dispatchers should be aware that although the inventory deployment operations benefit from improved infrastructure and technology, the test script case might not be as strong. Inventory deployment paradigms based on route condition indices adapt more slowly because costs have to show a return on capital investment structure as well as interoperability issue considerations between installations connecting in the contact procurement quote interface network.

Busy dispatchers have provided a test script service route reservation agreement template that will guide the planning of surge operations through specific steps. A unique and practical test script case can be built by substituting the appropriate geographical spatial consideration and local variables related to uniquely situated installations. However, while the test script case is necessary to justify an inventory deployment project based on route condition indices, it is not sufficient. The case for operational security must also be made. Dispatchers indicate that shared-track scenarios for service route agreement reservations and maintenance schedule frequency insertions may reduce the capital costs to develop a new inventory deployment system based on route condition indices when compared to a new separate system for surge contingency scenarios. Concurrent shared-track surge operations provide a mechanism to offer higher levels of route service for mobile units, while keeping the capital costs in check to satisfy political stakeholders.

Centralized dispatch control centres continue to be built with the introduction of improved technology and components that offer additional capabilities. Route service reservation agreement control systems provide three basic protective functions: 1) Inventory deployment detection based on route condition indices indicating presence and location of different types and sizes of fleet components, 2) Route service agreement separation—maintaining distances between the deployment of types and sizes of fleet components; and, 3) Service route agreement reservation interlocking involving on/off dispatch branches for conflicting routes through crossovers and inventory deployment turnouts..

Dispatch treatments of route service agreements offer active protection against three surge contingency scenarios regardless of fleet component type and size performance: 1) entrance to occupied route service mechanistic block; 2) Route service agreement speed with respect to signal aspect; and 3) Dispatch communication errors in designing route service agreement reservations for inventory deployment.

The most significant limitation for shared-track applications of conventional service route agreement reservation blocks is that multi-aspect signal technology, typically sufficient for some types of surge operations below security thresholds, is not adequate for shared-track operations, due to its lack of active protection. Surge contingency scenario signals relay information with the expectation that centralized dispatch operations will respond properly. Too often, override capabilities are not provided to catch and correct dispatch error at a high level of system design. Consequently, conventional signal systems are not likely to be deemed acceptable for a shared-track operation of different fleet component type and size, regardless of speed of the route service agreement reservation maintenance scheduling frequencies established between installations connecting in the contract procurement quote interface network.

The design of route service reservation agreement signal systems must be based on assumptions and parameters that include maximum speed of transfer transactions for inventory deployment based on condition indices, surge contingency acceleration and route maintenance scheduling frequency rates, as well as surge operation length and route gradient. Other factors, such as number of inventory deployment route tracks based on condition indices and features like reverse running of test scripts are also required, in addition to design factors related to test script braking performance and additional stop distance margins to service route reservation agreement system criteria to allow for potential responses to a inventory deployment crisis based on deficits in route condition indices. As shared-track operations are planned, the signal system must accommodate different types and sizes of fleet components, with widely different stopping distances for test scripts. Adjustments to the basic designs in the development of test scripts are made to take into account: 1) route maintenance system service objectives, 2) protective features, 3) dispatch speed conditions, 4) slips in scheduling for route condition assessments based on the contract procurement quote interface network between installations, and 5) test script stop system failures or deficiencies.

Key issues for shared-track operations include the compatibility of inventory deployment schedules based on condition indices with the dispatch control system at the central station. The fleet component types and sizes used on branch lines can function in a dedicated surge operational capacity and fitted with the route maintenance quote frequency for the contract procurement signal apparatus developed between installation in the network interface, with the dispatch control system ensuring spatial separation between different fleet component types and sizes. The inventory deployment controls on board a route service reservation agreement would be programmed differently to factor in test script braking rates and operating speeds in which inventory deployment based on condition indices could occupy two or more track blocks for surge contingency scenarios.

The most difficult condition for dispatchers to assess is the operation of a fleet component type and size outlier on the shared track spatial territory for a route service agreement scheduling frequency highlighting a requirement for special dispatching operation rules and procedures including but not limited to: 1) Temporal separation mechanistic models can be used to backstop the test script surge contingency scenarios where different fleet component types and sizes must detour over the shared test script spatial territory, and 2) If conventional inventory deployment of different fleet component types and sizes only exist for a short time and distance on shared-track test script, service route turnouts can be set and locked to give inventory deployment schedules based on route condition indices in the contract procurement quote network between connected installations the ability to pursue exclusive possession while they make the switch.

The service route agreement reservation dispatch control system will still prevent intrusions to the process of incorporating different types and sizes of fleet components employed for models of inventory deployment based on condition indices .Continuous route maintenance scheduling signal technology for contract procurement quote determination between installations connecting in the network interface requires high capital and maintenance costs. Recent technological advances have reduced the life-cycle costs of coded-track circuit based systems for fleet-based components. Compared to traditional signal systems, the dispatch frequencies for route tracking circuit systems has many advantages including: 1) Lower capital and maintenance costs and minimization of script testing and hassles involved in building inventory deployment schedules based on condition indices, 2) Use of fewer test script relays resulting in fewer cases for operational surge contingency scenarios, 3) Fewer dispatchers means fewer terminations and less wire tagging of test scripts enabling simpler installation quote networks for contract procurement, 4) Improved insulated joints and deployment envelopes, reducing costs for installation investments in common case tracking of maintenance costs, 5) Facilitation of advanced modern bid and award contract procurements in the quote network interface due to the requirements of technology and improved levels of portfolio pooling arrangements, 6) Quote tracking frequency circuit lengths are easier to tailor to a route service reservation agreement and 7) Shorter dispatch station times and crossings, enabling better operational control for surge contingency scenarios.

Both inventory deployment based on route condition indices and contract procurement quote schedules must be under the authority of the centralized dispatch control center with the capability to communicate with political stakeholders in charge of the unit. In the case of shared-track surge contingency scenarios requiring route service reservation agreements both short and long term operational factors encompass four likely contingency scenarios for the fleet during specialized operations: 1) Shared-track operation of different types and sizes of fleet component movements commingled on the same route track where inventory deployment based on route condition indices occurs; 2) Parallel movements involving different types and sizes of fleet components on one track and inventory deployment on an adjacent track; 3) Exclusive tracking use by different types and sizes of fleet components and inventory deployment schedules, and 4) Transitional quote frequency periods for contract procurement when route service reservation agreements are starting or ending, in conjunction with the inventory deployment period based on route condition indices evaluations starting or ending.

In this example, congruent results of the economic and security test script cases are integral to concluding that a shared-track project is feasible for defined surge contingency scenarios. Positive indications include but are not limited to: 1) In terms of capital cost structure, proposed shared track route service agreements have different drivers with respect to operational security and economic factors than a separate and parallel stand-alone system of different types and sizes of fleet components sharing a corridor with inventory deployment schedules based on route condition indices, and 2) Although the temporally separated route service agreement reservation process requires distinct modes of capital investment structure compared to alternatives than the proposed operation, the drivers that influence the route service requirements of inventory deployment schedules based on condition indices have important consequences for the expansion of surge contingency operations for routes tracking different types and sizes of fleet components.

The approach presented in this report has succeeded in providing evidence in surge contingency scenario projects that commenced route service agreements in accordance with the temporal separation policy should be considered. The development of rigid temporal separation test scripts to that of near shared-tracking models of fleet operations is reflected in real-world mobile examples involving test script dispatch by centralized control centres for inventory deployment based on condition indices. Each of the cited systems was initiated to serve a particular distribution requirement and, while each test script for service route reservation agreement started out simple and added complexity in response to changing requirements, it is apparent to dispatchers that the end result was improved capacity and flexibility for both modes of inventory deployment models based on route condition indices.

Route maintenance service modifications are likely required and achievable in the future for unanticipated surge contingency scenarios. Route service modifications are achievable, and automated system control features based on new technology and the presence of verifiable dispatch practices can be readily deployed for future modes of inventory deployment based on route condition indices, and calculations have been performed detailing reasonable cost benefit ratios that justified the investments in concrete metrics for improvement in centralized dispatch control centres. The incremental changes to the contract procurement quote frequency systems employed for scheduling route maintenance between installations connecting in the network interface have been validated by test script operational cases for surge contingency scenarios and have been deemed acceptable to dispatch operators in both scope and degree of efficacy. Progress made by current operating systems offers both guidance and confidence to prospective user-based protocols for inventory deployment based on route condition indices.

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This report has validated an incremental approach for policy makers to gain more experience in promoting route service reservation agreements with calculated investments in shared tracking for operational surge contingency scenarios, and these examples can be replicated in other installation settings employing contract procurement quote frequencies for route maintenance scheduling between installations in a common case tracking model for inventory deployment based on route condition indices. The increments can be separate or combined for: 1) Scripted temporal separation involving carefully defined procedures and scheduled movements, 2) Short interval temporal separation in which the period of temporal separation is not precisely defined by most installations but it is implied based on techniques developed by the central dispatch centre in promoting the use of test scripts which restricts the availability of different types and sizes of fleet components for limited but shorter operating windows, and 3) Extended temporal separation which applies vital inventory deployment control technology based on route condition indices to increasing portions of the route service reservation agreements, thereby enforcing measures designed to promote separation over more route tracks. At the present time, a demonstration project for shared-track operations may take one of two possible forms: 1) A currently operational, temporally separated shared-track line has identified a requirement to meet surge contingency scenarios that requires concurrent operations; or 2) A current operational system of different types and sizes of fleet components has demonstrated a requirement to extend or expand the inventory deployment scheduling system using an adjacent branch line route, defined by the operations in the centralized dispatch centre.

In conclusion, the future growth of shared-track operations in DoD inventory deployment based on route condition indices is contingent upon shared-track service route reservation agreements being economically viable and achievable without sacrificing the requirements of operations in which different types and sizes of fleet components are tasked with meeting the requirements of surge contingency scenarios. Technical advances in the future will detail more involved and developed test script cases which are likely to enhance the appeal of considering shared-track service route reservation agreements. The following recommendations for future investigation and action will support progress for present operations and those being planned or considered by busy dispatch operators. At a minimum, test script demonstration projects should encourage funding and oversight for the development, evaluation, testing and documentation of models, methods and procedures to expand concurrent track sharing in service route reservation agreements and involve political stakeholders, including a detailed evaluation of what types and sizes of concurrent fleet component operations are required and robust in meeting future surge contingency scenarios. The demonstration project should provide for design, deployment, testing, evaluation, and documenting, and recommend a preferred approach to developing future test scripts designed to report on the actual costs and derived benefits of extending concurrent shared-track operations for the fleet.

Template test scripts detailing risks involved in tasking fleet scheduling techniques for inventory deployment based on condition indices should be adapted to specific candidate route line segments under consideration by DoD. The methodology employed for the dispatch of this report used a limited data set for purely illustrative purposes. Expanding upon this report by applying the conclusions to a real-world mobile system could validate and calibrate the test script model, and quantify the benefits to the fleet in meeting the requirements of surge contingency scenarios in a manner that may be suitable for transferring advances in inventory deployment scheduling techniques based on route condition indices to other prospective network interface systems at DoD.