SYSTEM STATUS MANAGEMENT *The Fact Is, It's Everywhere*

System status management (SSM) is a powerful management tool. In the hands of an employer skilled in its use, SSM can mean better wages and working conditions for employees than would otherwise be possible. In the hands of a dispatcher skilled in its use, SSM can save a life that, without it, would have been lost. And in the hands of an EMS entrepreneur skilled in its use, SSM can force a competitor into an unscheduled retirement.

SSM is potent—so potent that in unskilled hands, it can also do a great deal of damage. With SSM, a little knowledge can truly be a dangerous thing.

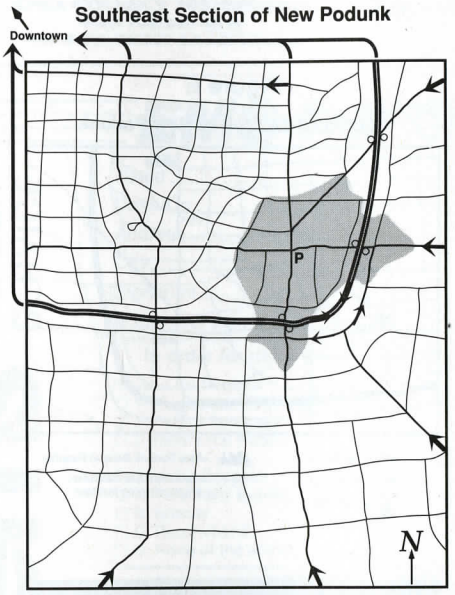
This article will expose and warn against the most common misconceptions about SSM, its purposes and its methods.

What is SSM? System status management is exactly what its name implies—the management of your EMS system's resources before and between calls. It is the process of preparing the system for the best possible response to the next EMS call. SSM's primary purpose (but not its only purpose) is to create and maintain the closest practical match between EMS demand and EMS supply. Paraphrasing my own testimony in his recent ruling on a related dispute, labor arbitrator William P. Hobgood said it best:

> *He [Stout] believes that the approach that brings about the best results is to have management and labor try to match supply with demand; to put the interest of patient care first; and to subordinate the rest of the system's interests to those of the patients.*

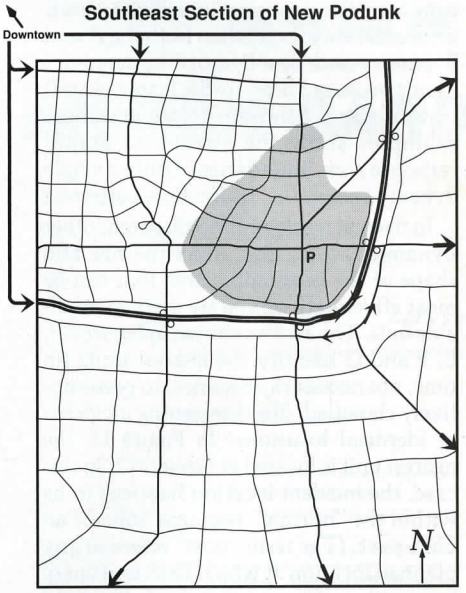
In practice, SSM can be very simple or highly sophisticated. It can be accomplished with great skill, or bungled badly. As I've written before, bad SSM is like bad anything else. . . bad. This article covers SSM technology from its basic application to its most advanced technical features. But before we can understand what effective SSM *is*, we must first understand what effective SSM *isn't*.

Figure A



Arrows indicate direction of morning rush-hour traffic flow. Shaded area indicates eight-minute response zone during morning rush-hour traffic under normal conditions.

Figure B

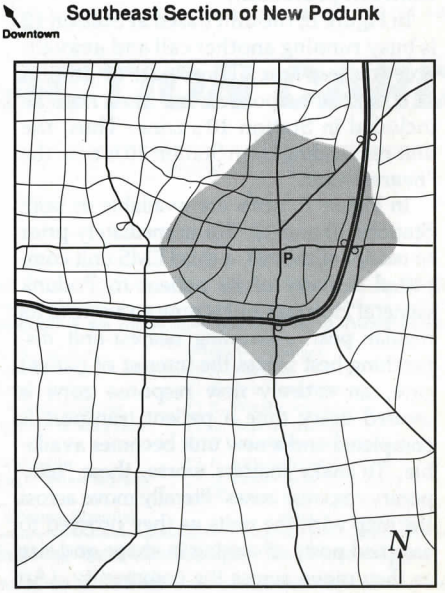


Arrows indicate direction of rush-hour traffic flow. Shaded area indicates eight-minute response zone during afternoon rush-hour traffic under normal conditions.

SSM Myth #1: *With SSM, ambulances "rove" throughout assigned response zones.*
SSM Fact: Because street criminals fear cops, police cars rove throughout their districts as a deterrent to crime. Since myocardial infarctions do not fear paramedics, skilled system status managers do not use roving ambulances. Roving ambulances can only waste human energy, fuel, and money.

SSM Myth #2: *SSM varies response zones based upon geographic patterns of demand, time of day and day of week.*
SSM Fact: For purposes of planning and managing vehicle deployment and event-driven redeployment, skilled system status managers do not use response zones at all. That is because experience has shown that, no matter how thoroughly the response zone concept is fine-tuned in practice, it cannot be made to cope effec-

Figure C



Shaded area indicates eight-minute response zone at 3 a.m. under normal conditions.

tively with the dynamic realities of the EMS environment.

For example, the response zones shown in Figures A, B, and C show the estimated eight-minute response zone boundaries of an EMS unit running "hot" from the same location on a typical weekday. As is often the case in urban and suburban communities, traffic-flow patterns on major arteries during a.m. rush hours reverse completely during p.m. rush hours. Since "upstream" rush hour travel is usually considerably faster than "downstream" travel, the shapes of the a.m. and p.m. eight-minute response zones (*i.e.*, Figures A and B, respectively) are very different.

In Figure C, the eight-minute response zone from the same post location at 3 a.m. is considerably larger than both the A and B zones, and much more concentric. That's because 3 a.m. traffic is sparse, and travel times are shorter. (Note that these examples show the effects on actual response zone boundaries of only a single dynamic factor, *i.e.*, traffic-flow patterns.)

In the real world of EMS dispatch, other dynamic factors also affect the size and shape of the geographic area that can be most effectively served by a given available unit. The arrows shown in Figures D, E, F and G identify the nearest units (in time, not necessarily distance) to presumptively classified, life-threatening incidents at identical locations. In Figure D, the nearest unit is located at Station 12. In this case, the incident location happens to lie within the "normal" response zone of an EMS post. (The term "post" refers to any planned location at which EMS units may be positioned for purposes of dispatch. The term "presumptively classified" means classified by the dispatcher in accordance with priority-dispatching protocols, *e.g.*, Clawson protocols.)

In Figure E, the unit based at Station 12 is busy running another call and unavailable for response. Thus, part of Station 12's normal response zone must now be included in Station 10's zone. Thus, the unit responding from Station 10 is now the "nearest unit."

In Figure F, units are available at both Stations 10 and 12, but immediately prior to receipt of the call, a third EMS unit completed delivery of its patient to Podunk General Hospital and is now en route to its regular post. Assuming nearest-unit dispatching best serves the interest of patient care, an entirely new response zone is created every time a patient transport is completed and a new unit becomes available. To make matters worse, these "temporary response zones" literally move across the map with the units as they proceed to assigned posts, changing in shape and size as they move across the community. (An alternative, of course, is to abandon the opportunity for faster response by ignoring these "moving response zones.")

Figure D

Southeast Section of New Podunk

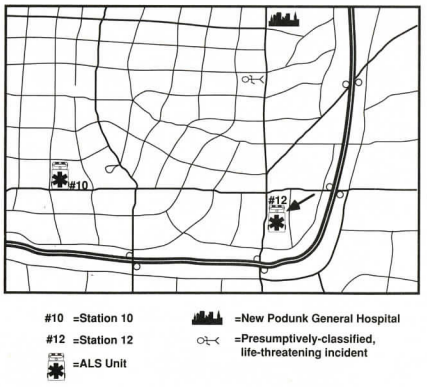
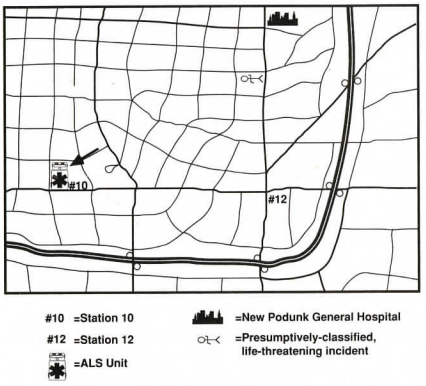


Figure E

Southeast Section of New Podunk



Just as the availability of a unit en route to its post effectively alters true response zone configurations, so does the presence of a unit en route to a lower priority call (*e.g.*, routine transfer or nonlife-threatening emergency). In Figure G, units are available at Stations 10 and 12, but a unit en route to a lower priority call was passing within one block of the life-threatening incident location at the time of call receipt. Again, assuming nearest-unit dispatch is in the best interest of patient care, even if the nearest unit is one that is en route to a lower priority call, a temporary, moving response zone is actually created around every unit en route to a lower priority call as it proceeds across the map.

Other factors affecting the reality of response zone shapes and sizes include weather conditions, road construction, railroad crossings, opening bridges over waterways, availability of mutual-aid providers and many others. The shapes, sizes and quantities of real EMS response zones are so dynamic that even elaborate computerized determination of second, third, fourth and fifth level response zones barely touches on the problems and opportunities inherent in EMS deployment and event-driven redeployment.

For these reasons, skilled system status managers long ago abandoned the response zone concept in favor of an entirely different and far more effective approach—an approach designed to squeeze the best coverage possible from the resources available at any point in time. Today's advanced SSM-based computer-aided dispatch (CAD) systems do *not* employ the response zone approach.

SSM Myth #3: *SSM's coverage strategy is based on frequency of call demand and does not consider geographic coverage, coverage of low-volume areas or concern for the welfare and morale of field personnel.*

SSM Fact: In addition to coverage of high-volume areas, coverage of low-volume areas and equality of response time reliability throughout all parts of the service area are primary objectives of skilled system status managers and are dramatically improved by skilled application of SSM principles. In fact, skilled SSM practice might well be described as the process of striking a reasonable balance among the following concerns:

- Adequate coverage of high-volume areas and peak-load periods
- Adequate coverage of low-volume areas and off-peak periods
- Employee health, safety, skills maintenance and job satisfaction
- Economic efficiency and the system's financial stability

Economic and operational realities dictate that each of these concerns must, to some extent, compete with the others. Excessive emphasis on high-volume area coverage must necessarily detract from coverage of low-volume areas. Excessive emphasis on economic efficiency will create unacceptable levels of job stress which can endanger both employees and patients, eventually generating unproductive friction within the organization sufficient to jeopardize the system's financial stability. Achieving and maintaining a sensible and stable balance among these competing concerns is, by definition, the outcome of skilled SSM. In contrast, excessive emphasis on any one of these concerns at the expense of any other is amateur SSM.

SSM Myth #4: *SSM "posting" means forcing ambulance crews to spend much of their time sitting in their vehicles at street corners and parking lots.*

SSM Fact: As noted earlier, a post is nothing more than a planned location at which EMS units may be positioned for purposes of dispatch. Where a system status plan (SSP) has become highly refined over a period of years by the efforts of a skilled sys-

tem status manager, frequently used posts are equipped with facilities for housing vehicles and crews between calls. Post locations employed with the SSP only a few hours per week (*e.g.*, a critical highway access point employed only during weekday evening rush hours) usually don't justify the cost of acquiring and maintaining permanent facilities. In those locations, "street-corner posting" is often used.

The most likely source of the confusion about posting is the need for more frequent use of street-corner posting during the early stages of SSP refinement. That is, when switching from a relatively static deployment method to a more flexible SSP, the initial step is to develop and implement an SSP based on detailed analyses of historical patterns of demand, traffic congestion, geographic requirements and many other factors. The primary purpose of that initial SSP is to furnish a foundation for refinement and fine-tuning based on detailed analyses of actual performance. (In practice, however, even the initial SSP usually produces dramatic improvements in both response time reliability and economic efficiency.)

Because it is highly probable that the SSP will be substantially revised and refined (several times) during the first 12 to 24 months after initial implementation, it is equally certain that initial predictions regarding where posts should be located and which posts will be most frequently used will also prove wrong in many cases. To refine the initial SSP, it must be implemented without much assurance that posts initially identified will be frequently employed, or employed at all, in later SSP refinements. For that reason, it would be foolish to invest the cost of developing additional permanent post facilities until after the SSP has been reasonably well-refined—usually about 24 months after implementation. (It is even more foolish to use existing facilities as posts, simply because they already exist!)

Thus, during its early stages of refinement, the initial SSP may reasonably employ the use of borrowed or rented facilities as post locations (*e.g.*, fire stations, other public facilities, hospital-based crew quarters, camper-trailer on empty lot, etc.) and, where unavoidable, street-corner posting.

For these reasons, a considerable amount of street-corner posting is often necessary and appropriate during the first 12 to 24 months of SSP refinement. After the SSP has been refined to a point of relative stability (no SSP is ever really finished), skilled system status managers begin to make arrangements for crew facilities at frequently employed post locations. Street-corner posting at less frequently used locations (*e.g.*, those averaging less than four unit hours per 24-hour period) may reasonably continue.

Where extensive or extended street-corner posting cannot be avoided without risking patients' lives, smart owners and managers go the extra mile to ensure that vehicles are as comfortable as possible by including in fleet specifications such amenities as luxury interiors, comfortable seats, stereos with CD or tape players, and even small 12-volt TVs (mounted in the rear, not in the cab). In hot climates, auxiliary engines powering electrical and A/C systems during street-corner posting may be appropriate and cost-effective. Crews should never be subjected to street-corner posting in cold or hot climates without environmental controls. In the context of extensive street-corner posting, the ambulance should be viewed as the paramedic's office and made as attractive and comfortable as those of top management.

Some SSM amateurs whose experiences have been limited to the early stages of SSP refinement or to working under unskilled or uncaring system status managers have made the mistake of thinking that the higher frequencies of street-corner deployment appropriate during the first 12 to 24 months of initial SSP refinement are also acceptable for use in a mature SSP. They are not.

SSM Myth #5: *Post-to-post movement is free to the system and need not be conserved.*

SSM Fact: Frequencies of post-to-post movement are expressed as the ratio of post-to-post moves to unit hour production during the same period. For example, in a system averaging 600 post-to-post moves per week (600 pp/wk.) and producing 1800 unit hours per week (1800 uh/wk.), the level of post-to-post movement is 1 pp/3 uh, or one post-to-post move for every three unit hours produced. Another way of saying this is that an on-duty crew will typically experience one post-to-post move during every three hours of their shift. (A ratio in the neighborhood of 1 pp/3 uh is fairly typical in systems using more advanced SSM strategies.)

Skilled system status managers know that post-to-post moves are a precious commodity in short supply. At very low frequencies of post-to-post movement (*e.g.*, a system-wide ratio of less than 1 pp/4 uh), the marginal cost per post-to-post move is nominal—about $7 to $12 depending on a number of factors. However, as the ratio increases, so does the cost per post-to-post move. That is partly because, at higher frequencies of post-to-post movement, shift schedules with higher effective direct labor costs per unit hour must be employed, thus raising overall unit hour costs. In addition, at very high frequencies of post-to-post movement (*e.g.*, above 1 pp/2 uh), growing frictions between management and labor inject additional hidden costs into each post-to-post move.

Ratios below 1 pp/4 uh rarely cause problems. As the ratio increases to 1 pp/3 uh,

changes must be made to scheduling practices, and complex differential dispatching rules may be required for short-shift vs. extended-shift crews. These types of changes may entail substantial costs that must be weighed against the benefits. As frequencies approach or exceed a ratio of 1 pp/2 uh, the cost/benefit ratio eventually falls below zero. In other words, don't do it. A good rule of thumb is that post-to-post movement more frequent than 1 pp/3 uh (system-wide average) may not be cost-effective and should be carefully evaluated.

SSM Myth #6: *SSM always requires sending the closest unit.*
SSM Fact: Seeking lower costs and improved response time reliability, modern EMS systems employ the "flexible production strategy." That is, the same ambulances and crews perform both emergency and routine transfer work—a single-tiered system. (The alternative—the "specialized production strategy"—uses a multi-tiered response wherein some ambulances respond only to emergency calls, while other ambulances respond only to routine transfer calls. In EMS systems that have failed to keep pace with the times, three or more specialized tiers can still be found.)

In single-tiered systems using advanced SSM, the primary objective of the system status controller (SSC) is to maintain optimum emergency coverage at all times. The skilled SSC also tries to minimize unnecessary post-to-post movement. Thus, on receipt of a routine transfer request, the skilled SSC often does *not* send the nearest unit. Instead, the skilled SSC selects a unit located at a lower-priority post or assigns the call to a unit that has just completed delivery of a patient and has not yet been reassigned to a post. In that way, higher-priority posts are not needlessly uncovered, and the need for post-to-post movement is often avoided.

SSM Myth #7: *Some EMS systems do not use SSM.*
SSM Fact: Every EMS system, and every EMS provider, uses some form of SSM. They may not call it SSM, and the way they manage (or mismanage) their coverage status between calls may be completely ineffective, even stupid and deadly. It may not be smart SSM, but it is still SSM.

In an article entitled "System Status Management" that appeared in *JEMS* in February 1983, I defined SSM as follows: *System status management refers to the formal or informal systems, protocols and procedures which determine where the remaining ambulances will be when the next call comes in.* Thus, the only alternative to system status management is system status *mis*management.

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Figure F

Southeast Section of New Podunk

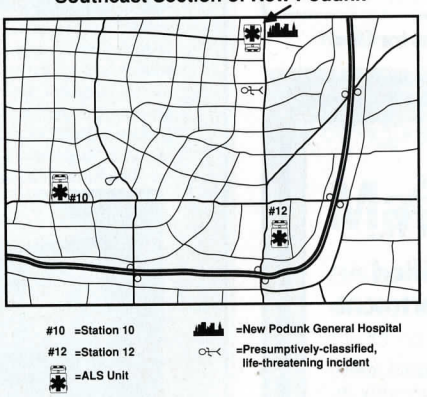
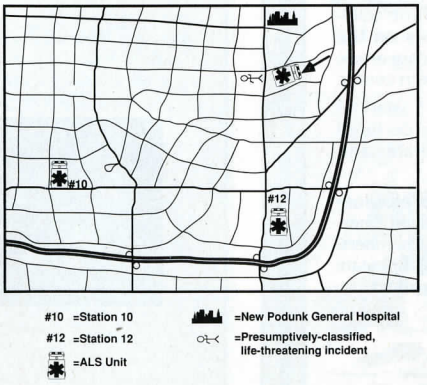


Figure G

Southeast Section of New Podunk



Your system status plan may be simple or elaborate, manual or automated, effective or deadly, formal or informal, written or unstated. But whether you know it or not, whether you like it or not, your system does have a system status plan. You cannot avoid it. To illustrate this fact in the same 1983 article, I described the informal and unwritten system status plan that was actually in effect in Kansas City, Mo. before our firm restructured that system:
There will be 14 ambulances on the street, 24 hours a day, seven days a week, for a total of 2352 unit hours of coverage a week. Every ambulance crew shall be on a 24/48-hour shift, and shall show up for work at a permanently assigned ambulance post, and shall relieve the crew on duty either on time or whenever that crew returns to its post. There shall be no rules governing suspension of nonemergency transfer work or out-of-town dispatches. If there are 13 calls in progress and only one ambulance left in the system, even though the emergency load may be about to peak, it's okay to send the last ambulance out of town or to dispatch it to a nonemergency call. Furthermore, if the only ambulances left in the system are stationed at the most remote and least active posts, while all the other ambulance crews in the system are working their tails off, it won't be necessary to relocate any of the remaining ambulances, especially if it is late at night and the outlying crews are asleep. Finally, whenever any ambulance completes a run, its crew shall return to its permanently assigned post, regardless of whatever else may be going on in the system at the same time. If a dispatcher would like to experiment from time to time by relocating ambulances during a shift, no rules would prevent such experimentation, no policies would guide such experimentation, and if the crews get mad because of the inconvenience, or the fuel bill rises noticeably, Lord only knows what might happen.

The multimillion dollar company that used the above system status plan is, of course, long out of businesss. Not surprisingly, this type of SSP is rarely written down. The question is *not* whether your system has a system status plan—it does. The question is whether your plan makes any sense.

This discussion of SSM technology is continued in Stout's book, High Performance EMS Systems (HPEMS), *to be published by Jems Publishing Company.*

Jack Stout has been at the forefront of innovations in the design and implementation of EMS systems for the past dozen years. If you have a question, a problem or a solution related to the public/private interface in prehospital care, address your letter to *Interface*, JEMS, P.O. Box 1026, Solana Beach, CA 92075.