FIRE SERVICES DEPARTMENT

FINAL REPORT

Consultancy Study on Paramedic Ambulance Service in Hong Kong

28 December 2001

Crow Maunsell Management Consultants Ltd

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GLOSSARY

Abbreviation	*Description*
A&ED	Accident and Emergency Department of Hospital Authority
AAMC	Ambulance Aid Motor Cycle
AED	Automatic External Defibrillator
Air-EVAC	Air Evacuation
AO	Ambulance Officer of FSD
AVLS	Automatic Vehicle Location System
CAD	Computer Aided Dispatch
CLIS	Calling Line Identification System
CME	Continuing Medical Education
CMS	Computerised Mobilising Systems
CPR	Cardio Pulmonary Resuscitation
CSB	Civil Service Bureau of Hong Kong Government
CTI	Computer Telephony Integration
DCAO	Deputy Chief Ambulance Officer of FSD
DDNOO	Day shift, Day Shift, Night Shift, Day Off, Day Off
DTMF	Digital Tone Multi Frequency
EC	Emergency Calls
EMA	Emergency Medical Assistant
EMA I	Classification of JIBC for ambulance personnel able to provide basic pre-hospital care
EMA II	Classification of JIBC for ambulance personnel able to provide advanced pre-hospital care
EMB	Education and Manpower Bureau of HK Government
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
FDNY	Fire Department New York
FSACTS	Fire Services Ambulance Command Training School (Ma On Shan)
FSCC	Fire Services Communications Centre (Tsim Sha Tsui East)
FSD	Fire Services Department
FSTS	Fire Services Training School (Pat Heung)
GDS(R)1	Point One of General Disciplined Services (Rank and File) Pay Scale
GIS	Geographical Information System
HA	Hospital Authority
HAZMAT	Hazardous Materials
HK	Hong Kong
HKCAA	Hong Kong Council for Academic Accreditation
ILCOR	International Liaison Committee on Resuscitation
IMS	Information Management System
IV	Intravenous
JIBC	Justice Institute of British Columbia

LAS	London Ambulance Services
MCTC	Mobile Casualty Treatment Centre
MDT	Mobile Data Terminal
MIS	Management Information System
NCO	Non-Commissioned Officer of FSD
OFTA	Office of the Telecommunications Authority
PAS	Paramedic Ambulance Service
PDA	Personal (or Portable) Digital Assistant
PVS	Planning Vision and Strategy Zones
QA	Quality Assurance
RAE	Resource Allocation Exercise (HK Government's annual budgeting process)
SAO	Senior Ambulance Officer of FSD
SGMS	Second Generation Mobilising System of FSD
SPSS	SPSS Inc. (a US based Solutions Provider)
SRS	Special Rescue Squad of FSD
TGMS	Third Generation Mobilising System of FSD
TPEDM	Territorial Population and Employment Data Matrix
UC	Urgent Calls (Requests for inter-hospital transfers)
UHU	Unit Hour Utilisation (of Ambulances)
USDOT	United States of America's Department of Transport
WDN	Wireless Data Network

Term	***Description***
Dispatch Algorithm	The Dispatch Algorithm is used in the context of the TGMS and refers to a computational sequence that determines the most appropriate ambulance to be dispatched to a call.
Dispatch Matrix	Computerised Mobilising Systems assist the Console Operator in determining which ambulance(s) should be assigned to respond to a particular call. The Dispatch Matrix is in essence a set of rules which defines which ambulance(s) should be assigned. The Dispatch Matrix is more complex when there are different types of calls (EC (with EMA) ,EC, UC) and different types of resources (Ambulances (with EMA II qualified supervisor), AAMC (with EMA II qualified supervisor), Ambulance, AAMC). With alternative desirable responses possible, the Dispatch Matrix will seek resources in adjacent depots.
DTMF Encoders	DTMF Encoders assist in communications between the ambulance and the HA's A&E Departments. The DTMF encoder is an electronic device that employs digital signals to transmit simple pre-coded messages to fixed addresses e.g. "Pick up radio we need to talk to you".
EMA I	EMA I qualified ambulance personnel provide patient care at the basic level. Their training includes use of the automatic external defibrillator

	(AED), oropharyngeal airways, spinal immobilization techniques, perform basic patient assessment, splinting, bandaging, control of hemorrhage, basic life support, oxygen adjuncts, oxygen and Entonox. The EMA I is the entry level position.
EMA II	EMA II personnel provide patient care at the advanced level. The EMA II personnel have completed training to the EMA I level and have completed additional training to qualify as EMA II. They are Senior or Principal Ambulancemen or an Ambulance Officer. Their training includes: providing a more comprehensive patient examination and advanced treatment to include nebulized medications, IM injections, IV therapy, administration of medications, use of the pulse oximetry and airway management that includes the laryngeal mask airway (LMA) and the Combitube. EMA II personnel treat the more serious patients including: asthma/COPD (chronic obstructive pulmonary disease), cardiac problems, major trauma, diabetes mellitus, and any unconscious patient.
Emergency Calls	Calls relating to persons who have sustained injuries or been suddenly taken ill.
Evidence based practices	Evidence based practices is introduced in the context that FSD as an organization will collect and use the recorded outcomes of its treatments to verify the efficacy of its clinical protocols. FSD would also collect similar information from other like organizations.
First Responder	First Responder refers to the person that first arrives at the scene to deliver effective assistance and care to a patient. In the case of cardiac arrest, time is of the essence and for the treatment to be effective it must be applied as early as possible. It may well involve application of special equipment such as the defibrillator. With Hong Kong's traffic congestion, FSD uses Ambulance Aid Motor Cycles to ensure the most timely response to calls involving unconscious and cardiac arrest. These FSD personnel are FSD's official First Responders. FSD provides citizens with training in pre-hospital cardiopulmonary resuscitation and this Report encourages the extension of this activity as well as targeting this training on special groups such as Property Managers and Security Service Providers.
Move-ups	This is used in the context of fleet deployment and refers to the redeployment of an ambulance from one base to another base in the event that the console operator believes there are inadequate resources at the (second) base. It could also be determined by the TGMS.
Multi-Tier PAS	In the EMA definition of clinical skills and knowledge, there are three levels – EMA I, EMA II and EMA III. FSD currently has two levels of paramedics. The term Multi –Tier PAS refers to these different levels of paramedic skills.

Pre-arrival Instructions	Pre–arrival Instructions refers to the instructions provided by the FSD Console Operator to the Caller requesting ambulance services. This needs to be a two-way dialogue between the Console Operator and caller such that the Console Operator can establish the relevant scenario and the appropriate advice to be passed onto the Caller. Pre-arrival instructions are particularly relevant when the patient is either unconscious or suffered cardiac arrest. Early intervention prior to the arrival of the FSD could mean the difference between life and death.
Response Time	Response time is defined as the interval between the time of call and the arrival of an ambulance or ambulance aid motor cycle (AAMC) at the street level of the scene. It is the sum of two consecutive components i.e. the activation time and travel time. Activation time is the duration between the receipt of a call and the time when the dispatch procedure is completed. Travel time refers only to the time taken by an ambulance or AAMC to travel to the street level of the scene.
Structured Call Taking	Structured call taking refers to a pre-defined protocol which the Console Operator follows explicitly, with each new question or action dictated by the response given by the caller.
Triaging	Triaging refers to the process of evaluating the alternative actions possible and proceeding with the most appropriate course of action. Triaging is carried out by the Console Operator, by the attending Ambulance Officer and by the HA staff when the patient arrives at the hospital. On a large scale event such as a major traffic accident, an Ambulance Officer of various ranks will arrive at the scene and takeover the triaging.
Urgent Calls	Calls for patients who require transport with some degree of urgency from a hospital or medical institution to an acute hospital for urgent treatment or investigation.

SYNOPSIS OF FINAL REPORT

This Study examined the implications of providing paramedic care on all ambulances and found that FSD is facing a surging demand for its ambulance services that goes beyond increases in population and in the elderly population (65+ years) which is the highest user group within the community. This surging demand now restricts FSD's ability to accelerate the provision of the full PAS.

In view of this and related issues that FSD needs to address, this Study concludes that - subject to the commitment of the additional manpower to enable the officers and ambulancemen to be released from normal operational duties as trainers and trainees respectively - it will take a minimum of three years to effect full provision of PAS on all ambulances.

In respect of the surging demand in calls, a substantial increase in manpower resources and other resources are urgently needed.

Initiatives needed in the short term are:

- Providing the necessary infrastructure to train more than 500 ambulance personnel to the EMA II level for next three years including: appointing a dedicated paramedic training team comprising a Senior Ambulance Officer and 9 Ambulance Officers, advanced recruitment of 40 new ambulancemen to enable release of the trainees; carrying out temporary alterations to the Fire Services Ambulance Command Training School to provide more training rooms; and utilising the Fire Services Training School at Pat Heung for the Initial Training.
- Investigating introducing staggered shift arrangement.
- Investigating introducing flexible Day/Night configurations.
- Increase the number of EMA II paramedics by 192 per year, continue recertification, CME, advanced air-way management training and initial recruit training.
- Providing for greater involvement of Medical Director – initially, one additional half time equivalent, and by April 2003 a further half time equivalent.
- Investigate and review the roles and responsibilities of frontline ambulance officers, particularly with respect to their role in quality assurance.
- Introducing a dedicated QA Team.
- Introducing a dedicated Customer Services and Relations Team.
- Developing User Requirements for the Ambulance Command's Information Management System.
- Developing protocols for introducing Structured Call Taking and Pre-arrival instructions.
- Planning and initiating the extension of the FSACTS at Ma On Shan to accommodate all FSD's ambulance training programs.
- Seeking approval of the permanent status of the EMA II special allowance for Senior Ambulanceman and Principal Ambulancemen and its extension to qualified Ambulancemen.
- Establishing a comprehensive Occupational Health and Safety Plan.

- Developing a five-year strategic plan specific to training and education.
- Introducing new methods of supplying educational clinical information.

Additional initiatives needed in the medium term are:

- Retaining advanced recruitment for ongoing training programs.
- Gathering Clinical Information System Data in the field electronically.
- Building the extension to FSACTS at Ma On Shan.
- Implementing the Clinical Information Management System.
- Introducing swing shifts.
- Introducing Pre-Arrival Instructions from Console Operator to the Caller.
- Reviewing the Dispatch Algorithms used by the Control Centre.
- Introducing a dedicated fleet to address Urgent Calls.
- Introducing Critical Care Transport Teams and HAZMAT Teams with special training.
- Introducing DTMF Encoders and improved radio connections between ambulances and the Accident and Emergency Department of hospitals.

Further Initiatives needed in the longer term are:

- Introducing Prioritised Dispatch.
- Introducing Emergency Response Teams with special training.

Ongoing Organisational Improvements needed are:

- Reviewing deployments at each depot to best match demand with calls.
- Further developing both the EMA I and the EMA II Training Programs.
- Increasing CME contacts between the Medical Director and paramedics.
- Securing additional resources to man more ambulances so that response performance can be maintained.
- Gaining Bureau's commitment to link provision of ambulance resources to ambulance calls.
- Providing more Ambulance Depots.
- Maintaining Recertification and Refresher Programs.

1. INTRODUCTION

1.1. Purpose of Report

1.1.1. This Report summarises the results of the review of Hong Kong's paramedic ambulance service (PAS) and discusses the development of full provision of PAS taking into considerations the related training issues, resource implications of PAS, response time performance of ambulance service, quality assurance and form of recognition for paramedic ambulance personnel. It incorporates justifications, an outline program for the changes needed and initial estimates of the resource implications for the full provision of PAS.

1.2. Scope and Objectives of the Study

1.2.1. The primary purpose of this Study is to examine the implications, manpower plan and resource requirements for providing paramedic care on all ambulances in the context of the adequacy of the current provisions and plans of PAS. FSD is committed to developing a PAS which shall be best able to meet the needs of Hong Kong.

1.2.2. The purpose of this Study is to :

- assess the implications and resource requirements in providing PAS on all ambulances
- formulate and recommend a detailed implementation plan for the provision of a full and comprehensive PAS taking into account all relevant factors and constraints and covering staff resources, their competencies, training needs, equipment, accommodation, logistic support, procedures and information systems.

1.2.3. The Study has included:

- Appraising the nature of emergency calls, the demand for PAS and the implications of full development of PAS on the 12-minute response time performance standard.

- Reviewing the manning requirements of operational ambulances and the shift patterns of staff to meet the demand profile cost-effectively with the full PAS implementation.

- Investigating the need for introducing a criteria-based dispatch system for a PAS comprising paramedics of different skill levels.

- Investigating alternative training options for EMA II, including the need for medical professionals' support.

- Investigating the need, feasibility and resource requirements for establishing a paramedic academy.

- Reviewing and making recommendations in respect of a Quality Assurance Program, performance monitoring system and customer services scheme for PAS.

- Evaluating the development of skill levels for pre-hospital care that are higher than EMA II, and the need for specialized teams in respect of pediatric, neonatal, burns, and cardiac arrest.

- Recommending appropriate forms of recognition of paramedics, and assessing the financial and staff planning implications.

- Investigating occupational safety issues related to ambulance works.

- Investigating possible diversion of patients to Hospital Authority's specialized service centers (e.g. in neurosurgery, cardiothoracic surgery, burns, traumatology, and neonatology) and formulating procedures for diversion of patients to these specialized service centers.

- Developing an implementation plan for the provision of PAS throughout the Fire Services Department (FSD).

- Assessing the resource requirements for development of PAS.

- Developing a resource planning package that utilizes population data and forecasts increases in demand for PAS.

- Drawing a comparison of Hong Kong's PAS with international standards, evaluating their suitability for adoption in Hong Kong and recommending appropriate best practices.

1.3. Background including Recommendations from Previous Studies

1.3.1. FSD wishes to benchmark its performance against similar PAS with a view to developing continuous improvement in the services it provides. If its initiatives are supported by Government through its policies and resource allocations, FSD will not only maintain its speedy attendance and transport of patients, but also raise its level of clinical knowledge and skills - further enhancing the services it provides to the community.

1.3.2. Hong Kong is often characterised by its multi story dwellings. This environment creates unique problems for FSD that are evident, as the service benchmarks its performance. Most large ambulance service

providers have adopted the total time to defibrillation as the key performance measure in evaluating the response to cardiac arrest. While FSD's introduction of the PAS Response to cardiac arrest and unconscious patients has addressed this challenge, FSD will require some innovative approaches for serving the cardiac arrest victim if it is to measure well against other similar services. This response issue applies to other patient types as well, in terms of improving patient outcomes. It is in the context of Hong Kong's characteristic high rise environment and its narrow and congested roads that FSD has steadfastly maintained its three man ambulance crews – an approach which is adopted in most Asian countries.

1.3.3. In terms of EMA II response capability, FSD has 86 day and 41 night EMA II ambulances available to respond. This configuration is representative of the roster for the entire PAS system. The matching of demand for an EMA II ambulance is quoted at 77% and it is FSD's objective to improve on this matching rate by rostering at least one EMA II paramedic on each ambulance by 2005. A substantial training program is needed – a difficult challenge in the face of surging call demand.

1.3.4. FSD has commissioned studies in the past to develop a clearer understanding of the issues involved in maintaining or improving its response time performance and improving clinical standards. The current demand is growing at around 7.6% annually and if the trend of other developed nations is used as an indicator, there is little likelihood of this increase declining, in fact there is the possibility that the rate of increase may accelerate. The Hong Kong population is increasing at a rate of 2.3% annually and the population aged more than 65 has a higher rate of increase. (HK Monthly Statistics Digest 2000). While this last factor certainly contributes to an increase in the current demand there are as yet unidentified reasons behind this demand. These may include changes in public expectations, hospital release policies, the scope of the medical services available, etc.

1.3.5. In 1986, the ORH consultant (previously known as HORU) conducted a study on the provision of ambulance services in Hong Kong. The consultancy study recommended, inter alia, a ten-minute target travel time should be achieved for 95% of emergency calls. This recommendation was endorsed by the previous Executive Council in 1987 and has since been used as the basis for the development of the emergency ambulance service. But due to resource constraints, FSD now pitches its performance target at 92.5% emergency calls attended within 12-minute response time.

1.3.6. The ORH Consultancy Study of 1995, amongst other things, identified the issue of roster configurations in the context of the demand profile by time of day and of geographic location. Since that time the demand profile and PAS structure has changed and the current mismatch of response

capacity is in the evening rather than the daytime as it was in 1995. A number of factors have influenced this change including the removal of the non-emergency calls (largely occurred in day time) to the Hospital Authority. Nonetheless, the 1995 study identified that the spreading ambulance deployment across a wider area is the only way to meaningfully reduce travel time, which is the key determinant of response time. It also discussed the issue of adequate manning levels to accommodate sick leave and training requirements.

> *The current manning formula makes no allowance for absence due to sickness or training and do not make proper allowance for holidays. In the sample period (January 1995) the overall shortfall of shifts was 6.6 percent, i.e. 6.6 % of planned ambulance deployments were not achieved. …. In terms of overall establishment, an increase of between 4.2 % and 5.3 % is required to adequately cover for staff absence for sickness, leave and training.*

1.3.7. This issue continues to exert pressures and in essence many of the principles classified as important in the 1995 study remain valid today albeit the demand patterns to be served have altered since that time. The impact of this was clearly evident in the examples quoted within the FSD's PAS Review 2000.

> *For the period of January to March 2000, only 83.2% and 88.7 % of the EMA fleet were maintained for day and night shifts respectively. ….. In fact, according to the figures of January and March 2000, the drop in daily EMA ambulance availability is partly due to reasons of sick leave and release of staff to training. …. Considering the training reserve, natural wastage of EMA II's and the average shortfalls ….. the Review Committee recommends that an appropriate reserve pool should be established.*

1.3.8. The conclusions of FSD's internal report "PAS Review 2000" included:

- There is ever surging demand for PAS
- The TGMS may improve FSD's responses to, and matching of PAS calls, but not before 2003
- With response time the top priority, mismatching of responses to PAS calls cannot be eliminated
- Matching rate will deteriorate without additional EMA II resources
- Existing training resources are not able to provide an accelerated program of EMA II training
- The granting of the special allowance to EMA II supervisors should be maintained until all supervisors are qualified
- With commitment of adequate resources, training of all Principal and Senior Ambulancemen could be completed by 2004/2005 (within 3 years following Government's commitment of the required resources)

1.3.9. Realising the wider implications of the future development of PAS for Hong Kong, FSD recommended an independent investigation in respect of the paramedic skills needed including the need for advanced life

support services at EMA III level, training and recertification program, quality assurance, human resources and facilities requirements.

1.3.10. In recognizing the time needed to progress this initiative, FSD committed to continuing its efforts to develop its PAS capability by:

- Continuing to train and qualify Supervisors to the EMA II level
- Manning more AAMC's with EMA II qualified supervisors
- Upgrading ambulances on offshore islands to EMA II level
- Enhancing the existing Quality Assurance Program
- Employing a full-time Medical Director to assist in taking forward the PAS initiative

1.3.11. This report was widely circulated and it is clear that there is overwhelming support for FSD accelerating the transition to a full PAS.

1.4. Findings

1.4.1. While recognizing the recent developments in the Ambulance Services, this Study has highlighted the resource constraint problem facing FSD. Their overriding operational objective - which is proving very difficult in the face of mounting demand not only for PAS Calls but also for all Emergency Calls - is to achieve 12-minute response time for at least 92.5% of its Emergency Calls. Although, better demand management (such as, in the short term, establishing a Customer Services and Relations Group to educate the public on the proper use of emergency ambulance service, and in the long term, introducing some form of charging for ambulance or A&E services) may help in alleviating this problem, more ambulance shifts and more ambulancemen are urgently required to cope with the immediate needs. These must be secured as early as possible. Without addressing overall resource deficiencies, any redeployment of ambulance supervisors to the EMA II Training Program will exasperate the current response performance and degree of mismatching.

1.4.2. The FSD's internal report "PAS Review 2000" recommended accelerated training of EMA II paramedics as a way of reducing the mismatch of EMA II calls to EMA II capability. FSD estimated that it needed to train more than 500 staff to EMA II in order to roster a minimum of one EMA II paramedic per ambulance. We believe that the rate of training required to achieve this minimum provision of one EMA II paramedic per ambulance within 2 years would create unreasonable pressure on the current ambulance services in the areas of response times, crew configurations, overtime expenditure and capacity to accommodate students during training.

1.4.3. With the resources needed for these initiatives in place, FSD will be in a good position to progress its plans and have the opportunity to introduce some further improvements to its current practice that in total will provide for a stepped improvement. By adopting a strategic approach to achieving their various goals, FSD could position itself well for the future including addressing the surging demands for its services while maintaining its commitment to the quality and timeliness of its services.

1.4.4. With FSD facing other challenges, their achieving the transition to a full PAS within a three-year period will be challenging.

1.4.5. An acceleration of this three year period is not practical as alternative measures needed will have lead times that will delay the initiation of the transition and therefore the time by which the full PAS will be achieved. By way of example – additional training facilities would be needed for a higher throughput. The recommended strategy assumes that all EMA II training will be provided at FASACTS by temporarily relocating all other FSACTS training to the FSTS at Pat Heung. Any increase in the EMA II training sessions will mean that the FSACTS cannot be used and a new venue for the EMA II training will be needed with the associated lead time in securing and then establishing such a facility. Other constraints include the number of officers qualified to lead the EMA II training programme, as well as additional ambulancemen to fill shifts while trainees are attending the training courses.

1.4.6. By adopting a three years as providing an appropriate window for achieving the PAS initiative, it is important to bring forward the necessary recruitment for the increase in ambulance resources needed to meet the actual and projected growth in the number of Emergency Calls. With more ambulances, additional Supervisor Posts are also needed to ensure the availability of appropriate crew for both EMA II Ambulances and the AAMC.

1.4.7. Other initiatives cannot be forgotten. Strengthening of the Ambulance Command is needed in respect of increased involvement of the Medical Director, additional EMA II Trainers at Officer Level, an expanded Quality Assurance Team, a new Customer Services and Relations Team, the addition of MIS capability, greater involvement in the development of the TGMS, and preparation for improved call taking and dispatch once the TGMS is in place. There are many other areas for which recommendations will be forthcoming through this Study.

1.5. Structure of Report

1.5.1. This final report comprises this Introduction and five further chapters:

- Chapter 2 Description of the Ambulance Services
- Chapter 3 Need for a New PAS for Hong Kong
- Chapter 4 Shorter Term Measures for an Improved PAS
- Chapter 5 Longer Term Initiatives needed for PAS
- Chapter 6 Recommendations

1.5.2. Chapter 2 provides a description of the current Ambulance Services including all its elements. The Consultant Team comprised individual consultants experienced in planning and operating ambulance services from North America and Australia. FSD provided a liaison team and provided the Consultant Team with open access to its officers, NCO's, ambulancemen and their Unions. The Consultant Team visited key facilities such as the Fire Services Communications Centre, the Fire Services Ambulance Command Training School, and typical ambulance depots and traveled with the ambulance crew on operational shifts. They went with the ambulance crew from the response through to hospital. The Consultant Team also met with the Medical Director and medical practitioners from the Hospital Authority. The Consultant Team was also provided with the complete call records for 2000 for their analysis. This thorough briefing enabled the Consultants to document the Ambulance Services as they exist today and will be developed through commitments such as the Third Generation Mobilising System.

1.5.3. Chapter 3 provides an analysis of the current situation in the context of FSD's commitment to enhance the capability of the new Paramedic Ambulance Service. The need for issues to be addressed as well as the opportunities of uplifting the services in line with the community's wants and FSD's commitment to service these needs are grouped in the following subjects:

- Growth in demand
- Full Provision of PAS
- Skill level (of all ambulancemen with focus on paramedics)
- Specialized Ambulance Teams for Pre-hospital Care
- Mobilisation and Communication
- (Other) Improvement to Ambulance Service
- Human Resource Issues

1.5.4. Chapter 4 describes the short term measures that are needed to address the problems and the opportunities discussed in the previous chapter. In developing these improvements, the Consultants discussed alternative ideas and options with the FSD officers, the Medical Director, representatives of the HA, the TGMS Project Team and representatives from both the Ambulance Officers' Association and the Ambulancemen's Union. These are grouped in the following subjects:

- More Resources to Meet the Surging Demand

- Transition to Full PAS
- Quality Assurance
- Ambulance Command Training School (FSACTS)
- Mobilisation
- Operations
- Better Information Management
- Customer Services and Relations
- Human Resource Issues

1.5.5. Chapter 5 describes the suggested longer term initiatives that will address the problems and the opportunities discussed in the Chapter 3. These are grouped in the following subjects:

- Longer Term Increase in Resources
- Training
- Mobilisation
- Operations
- Other Technological Improvements
- Emergency Medical Response and Critical Care Transport Teams
- Strategic Plan

1.5.6. Chapter 6 summarises the key recommendations with a focus on those with resource implications. These are grouped in the following subjects:

- Increased Establishment
- Transition to Full PAS
- Advanced Recruitment to Meet Accelerated PAS Upgrade Training
- The Medical Director
- Quality Assurance Team
- Customer Services and Relations Team
- Human Resources Issues
- Special Operations Teams
- Training
- Deployment
- Mobilisation
- Technology
- Resource Implications
- Implementation Plan
- Further Study

1.6. Methodology Followed

1.6.1. The conducting of this Study involved extensive consultation between the FSD and the Consultants. The Consultant Team involved three overseas professional paramedics. Two were senior managers from Melbourne's

Metropolitan Ambulance Services and the other from New Jersey. These specialist advisors developed a close rapport with staff from FSD which enabled quick progress on this highly complex Study. In respect of the clinical aspects of the Study, the consultation involved the Medical Director and extended to members of the Pre-Hospital Care Sub-Committee of the Hospital Authority.

1.6.2. In respect of the analysis of call data, FSD provided detailed information on the Call Data for 2000. This provided a sample size of around 500,000 including all calls spanning all four seasons. A database has been developed and statistical analysis was carried out using the SPSS software package. This has provided a firm basis for the development of the resource based planning model.

1.6.3. The detailed steps in the methodology were:

1. Identify and review options for PAS - Staffing, Systems, Logistics, Management, Outsourcing and investigate Alternative Service Strategies (e.g. multi-tiered PAS, with Specialist Teams, etc) and agree definition of international "best practice" PAS standards as basis of benchmarking
2. Analyse available emergency call data and alternative PAS standards and agree alternative PAS service scenarios comprising multi-tier hierarchies of paramedic competencies including paramedics able to provide a higher level of pre-hospital care in respect of pediatrics, neonatal, burns, cardiac, etc
3. Utilize available emergency call data to investigate the manning and logistical support needed to introduce criteria-based dispatches based on different (agreed) PAS service scenarios available with multi-tier paramedic competencies
4. Investigate the implications of maintaining specialist teams
5. Assess the need for support from medical professionals for the different scenarios
6. Identify means by which FSD might effectively divert patients with special needs to appropriate specialized service centers and investigate the implications of this
7. Investigate the shift patterns appropriate for meeting the demand profile cost-effectively with the different scenarios described above
8. Analyse Current Skills. Review competencies of paramedics and ambulancemen in FSD and formulate a training program to meet the competency needs of the various scenarios
9. Benchmark local PAS standards and comment on suitability and appropriateness of alternative "best practice" standards for Hong Kong.
10. Identify the alternative and cost effective means of developing the overall competency of paramedics and ambulancemen in the FSD to meet the different scenarios in both the short and longer term

11. Formulate a Draft Training Program in order to provide a higher level of pre-hospital care in respect of pediatrics, neonatal, burns, cardiac, and other specific areas that might be identified through the review of emergency call data
12. Investigate the resources needed to establish a Hong Kong training facility for training paramedics to the competencies needed for the different scenarios and thereby investigate the feasibility when compared with other training options
13. Recommend a quality assurance program, including a performance monitoring system and Customer Services scheme relating to the recommended PAS
14. Formulate appropriate forms of recognition for paramedics
15. Develop a PC based resource planning model to facilitate analysis of available emergency call data, including the nature of calls and the implications on manning requirements for the PAS
16. Establish the manning requirements (and logistical support) for paramedics based on existing emergency call data and agreed PAS
17. Extend the PC-based resource planning model to allow population growth and changing assumptions in respect of demand.

2. DESCRIPTION OF THE AMBULANCE SERVICES

2.1. Ambulance Command

2.1.1. The Ambulance Command is one of the four operational commands of the Fire Services Department. It is responsible for providing emergency ambulance services to the Hong Kong SAR community. It is based at Fire Services Department's Headquarters Building in Kowloon.

2.1.2. Operations are divided into 3 regions i.e. Hong Kong, Kowloon and New Territories with the outlying islands included in the Hong Kong Region. The regions are further divided into seven divisions – Hong Kong East, Hong Kong West, Kowloon East, Kowloon West, New Territories East, New Territories West and New Territories South. Each region comprises a number of Ambulance Depots and Fire Station outposts.

2.1.3. A Senior Assistant Chief Ambulance Officer oversees the largest New Territories Region while two Assistant Chief Ambulance Officers oversee the other two regions.

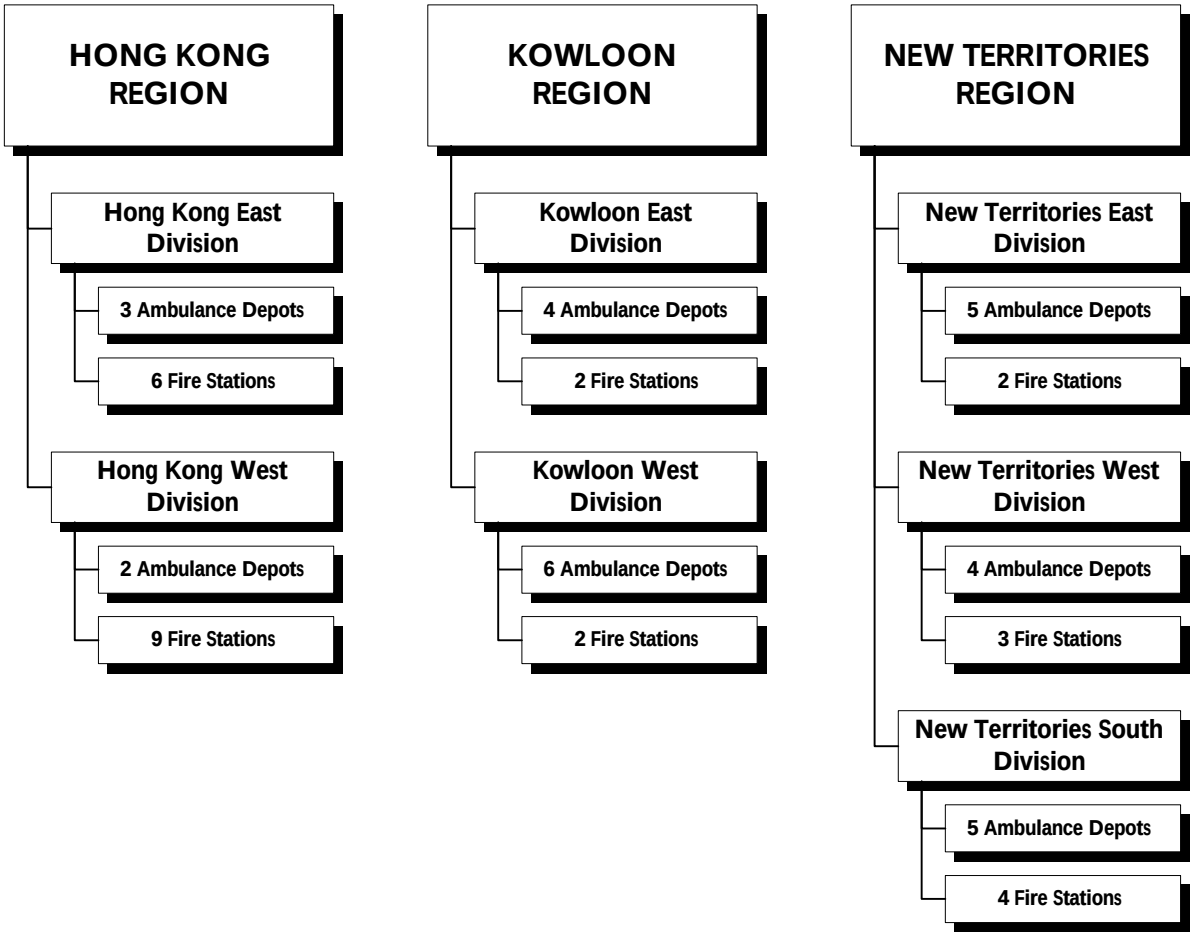

Figure 2.1 Chart Showing Regional and Division Structure

2.1.4. The current staff comprises 2,249 Ambulance Officers and Ambulancemen, supplemented by approximately 140 non-uniformed personnel.

2.1.5. A Superintendent oversees all ambulance depots in a Division.

2.1.6. Each depot has a depot commander of Senior Ambulance Officer rank present during office hours. Each depot commander is supported by an Ambulance Officer.

2.1.7. The depot commander oversees ambulances based at fire station outposts.

2.1.8. For the remote regions of Hong Kong there is a Land Rover Ambulance. This unit is deployed to incidents which are difficult to access.

2.1.9. The outlying islands receive ambulance service from specially designed mini-ambulances on those islands.

2.1.10. Principal Ambulancemen are assigned to fourteen major hospitals in Hong Kong to oversee the movement and tracking of FSD ambulances and staff through the Accident and Emergency Departments. They also function as the point of communications between the A&E Department and the ambulance staff, relaying patient condition and estimated time of arrival information to the A & E Department staff.

2.1.11. The Fire Services Ambulance Command Training School (FSACTS) has eight instructors, all ambulance officers, comprising two Senior Ambulance Officers who oversee the training, four permanently established Ambulance Officers and two supernumerary Ambulance Officers. Other instructors are deployed throughout the command in operations, headquarters, etc. These additional instructional staff are transferred to FSACTS for the training on an as needed basis. FSACTS staff is also tasked with quality assurance for the service.

2.1.12. Ambulances are all manned with a Senior or Principal Ambulanceman (the ambulance supervisor) and two Ambulancemen assisting in rendering patient care and ambulance driving. There are a total of 2,144 ambulancemen. This comprises 774 ambulance supervisors (or NCO's holding a rank of Principal or Senior Ambulanceman and 1,370 Ambulancemen. Of the 774 NCO's about 35 % are qualified to EMA II level.

2.1.13. Ambulancemen are in the main rostered on the basis of "day/day/night/off/off" with shift change times at 8:30 am and 8:30 pm.

2.1.14. Ambulance Aid Motor Cycles are all manned by ambulance supervisors some of which are EMA II qualified.

2.1.15. The Medical Director maintains an office at the Ambulance Command's Training School – he is currently half time, however there is a previous proposal that this will become full time.

2.2. Special Rescue Squad

2.2.1. FSD provides men and ambulances for the ambulance component of the Special Rescue Squad (SRS). The SRS is equipped and trained to perform search and rescue in respect of major disasters both in Hong Kong and overseas.

2.2.2. The SRS comprises 200 ambulancemen permanently manning 20 ambulances (day shift) and 10 ambulances (night shift). Through redeployment, the ambulance component of the SRS responds to emergency calls once activated for an SRS incident. Each supervisor is EMA II qualified.

2.3. Ambulance Deployment

2.3.1. Ambulance Command provides emergency ambulance cover across the HKSAR. Central control is provided by the Fire Services Communications Centre.

2.3.2. Within its three Regions, the ambulance resources are deployed to 29 ambulance depots and 28 fire stations (or ambulance outstations). In addition, ambulances might be "posted" to fire stations on a standby basis as well as at strategic locations such as Lo Wu Border Control Point. The need for additional depots or fire stations is reviewed regularly and Attachment 3 summarises developments in FSD's ambulance services in the last five years.

2.3.3. There are a total of 244 ambulances and 35 AAMC. There are 212 ambulances currently on day shift and 114 ambulances on night shift.

2.3.4. Of these ambulances, 86 day shift ambulances and 41 night shift ambulances are manned and equipped at EMA II level.

2.3.5. There are currently 31 AAMC operational in the day shift (only) and of these 15 are manned by supervisors qualified to the EMA II level.

2.3.6. There are also three Mobile Casualty Treatment Centres. These are purpose built vehicles designed to serve as an on the scene treatment center for major incidents. It is fitted with communications and medical equipment and will function as a treatment center at incidents involving a large number of casualties. Once the MCTC arrives at the scene of an incident, the crew immediately prepare it as a triage and treatment center as well as a minor operation theatre for a medical team.

2.3.7. The deployment of ambulances is determined by Ambulance Command from consideration of call volumes and achievement of the FSD's 12-minute response time target. Deployment is reviewed on a regular, on-going basis as well as at the time additional resources become available – with the objective being the most effective in terms of ensuring the response time performance measure is met. The review of deployment takes into consideration:

- output of the computer model provided by a previous consultancy (ORH)
- recorded response time performance by depot and division
- number of calls arising at each depot and division.

2.3.8. Deployment on a daily basis is determined by the particular situation developing in the field. Deployment involves transfers or postings on an as needed basis. In deploying additional manpower resources to depots and divisions that become available to FSD, the Ambulance Command also takes into account trends in demand and/or response time performance.

2.3.9. Deployment is accomplished through the ambulance depots and outstations. While FSCC is responsible for the mobilization and availability of resources, the daily manning of ambulances is monitored by the Depot Commander.

2.4. Planning

2.4.1. The planning function is currently carried out at the Headquarters of the Ambulance Command in the Fire Services Headquarters. Planning Group are responsible for planning, monitoring and reviewing deployment of the Ambulance Fleet.

2.4.2. Data for performance and demand are produced from the FSCC's computer on a monthly basis using general purpose data analysis tools. Information is imported into preformatted spreadsheets to facilitate analysis and reporting. Reports show the performance and demand by region.

2.4.3. Planning is a key function and will gain further prominence once key performance data becomes more readily available to the service. Such information provides a basis for addressing the issues identified and introducing changes. The responsibilities, scope and methodology of the planning function are significant. They are also key elements of any quality assurance program.

2.4.4. Ambulance Command analyses the response for all calls for which the response is outside the 12-minute response time pledge and the reason for those delays.

2.4.5. Currently, central recording and easy retrieval of clinical information is not available. As a result, Ambulance Command does not have a ready means of analyzing clinical data to determine long term trends in population needs or other system information such as the type of emergencies most frequently encountered.

2.4.6. The collection and formatting of information is critical to any benchmarking program and to FSD's strategic planning.

2.4.7. Formulation of standard reports for management to quickly assess and analyse specific performance areas requires careful consideration. These will lead to informed decision making processes in terms of future change in Ambulance Services.

2.5. Mobilisation and Communications

2.5.1. The Fire Services Communications Centre (FSCC) is also located at Fire Services Department's Headquarters Building and call taking and dispatch is managed and operated within the Department. From an Ambulance viewpoint, the FSCC comprises consoles covering the three regions. The FSCC console operators classify calls for ambulance service as EMA emergency, regular emergency and urgent ambulance call types and then dispatch the operational ambulances and/or ambulance aid motor cycles (AAMC) to the field.

2.5.2. Key functions of the Console Operator and the Mobilising system provided in the FSCC are:

- Receiving calls from the public,
- Triaging the calls to determine the response type required,
- Reviewing and passing to the ambulancemen information relating to the address from the digitalized road map information,
- Tracking vehicle locations,
- Determining the nearest appropriate ambulance,
- Accessing appropriate screen display options.

2.5.3. The console operators of the FSCC are trained to serve both the ambulance command and the fire commands. In general the console operators take calls for either ambulance services or fire services. When the demand on console operators for one of these services is overloaded, the console operators assigned to the other service will assist in taking calls.

2.5.4. Dispatch is supported by computer software and comprehensive information regarding each call is recorded and made available to FSD for analysis.

2.5.5. The existing system, known as the Second Generation Mobilising System (SGMS) has been in use since 1991. It has a design capacity for handling up to 56,700 fire and 568,600 ambulance calls per year. With the steady year-on-year growth in the number of calls for ambulance services, the calls may reach this limit by 2002.

2.5.6. The SGMS's functions and capacity have been stretched to their limits. This renders further upgrading of both the hardware and software of the existing system neither practical nor cost effective.

2.5.7. SGMS requires manual input of location code and status. Such manual processing has limitation in providing accurate and updated data efficiently and in turn affects the search of fire and ambulance resources for efficient despatch to the scene.

2.5.8. The SGMS has limited functionality and will not be compatible with needed supporting systems such as AVLS, GIS which are described below.

2.5.9. At present, about 94% of emergency ambulance calls meet the target despatch time (two-minute for emergency calls). Growth in the number of emergency ambulance calls and the demand for continuous service improvement now requires more complex mobilisation of ambulance resources such as the dispatch of ambulance aid motor cycle (AAMC) and EMA II Ambulances to provide speedy response and enhanced pre-hospital care for the community.

2.5.10. In March 2001, FSD appointed a contractor to implement the Third Generation Mobilising System (TGMS). TGMS will adopt an open platform design with a graphic working environment. It will have a larger design capacity (781,000 ambulance calls), enhancement in various mobilising activities and resource identification, and flexibility for further upgrading to cope with the projected growth in call volume in the next ten years and to meet the target dispatch time. The estimated life span of TGMS will be through to 2013. The TGMS will comprise:

- Computerised Mobilising System (CMS) – it will be a high-power system built on an open platform with pre-emptive multi-tasking functionality to cope with the projected workload during the lifespan of TGMS;

- Telephone System – the system with Computer Telephony Integration (CTI) technology will facilitate Automatic Call Distribution. Through

the Calling Line Identification System (CLIS), address information of the caller using lined telephone network could be readily retrieved to help speedy identification of incident address;

- Automatic Vehicle Location System (AVLS) – it will provide accurate location data of all FSD mobile resources, such as vehicles and fireboats, automatically;

- Geographic Information System (GIS) – the system working with AVLS and CMS will indicate on digitized map the nearest available fire and ambulance resources to any reported address of incident for efficient mobilisation. If needed, it will also indicate the shortest route to the incident. Furthermore, it will provide other useful information, such as location of hydrants, gas pipe layouts, building information and vehicular access, etc. to facilitate fire-fighting and rescue operations;

- Wireless Digital Network (WDN) – this network will provide effective data and image transmission for AVLS and Mobile Data Terminals installed in emergency vehicles;

- Mobile Data Terminals – these terminals will be installed in all fire and ambulance vehicles to receive and dispatch incident information through WDN;

- Information Management System – it will integrate with all systems for records logging, analysis, resource management, etc.; and

- Other supporting systems – they include the Security System, the Fault Indication Management System, the Intercom System, the Uninterruptible Power Supply System, the Telecommunication Network, etc.

2.5.11. The TGMS will enable FSD to bring up the performance to meet the target dispatch time and handle the projected growth of emergency calls up to and including year 2013. It will also help improve rescue operations in the following ways:

- accurate and efficient resources deployment – TGMS will identify and locate real time resources automatically for immediate dispatch to the scenes of incidents. It will help to achieve more accurate incident tasking and optimise resource management;

- accurate incident address – FSCC staff can easily ascertain through CLIS incident address for timely despatch of resources and it minimises mis-reception of the reported address. However, address identification is currently not applicable for callers using mobile phones. FSD will liaise closely with the Office of the

Telecommunications Authority (OFTA) on the technological development of the mobile network;

- direct and effective operational information exchange – the automation features of TGMS can improve the efficiency in information exchange by means of graphics and text transmission through WDN and hence reducing the time spent on voice communication. Moreover, vital operational information/data, such as caller's information, chemical data, location of hydrants and public utilities, building information, vehicle access, incident details, etc. can be accurately exchanged between FSCC and the resources at scene for effective management of fire-fighting and rescue operations;

- enhanced flexibility in resources identification and mobilisation – through open platform design, CMS allows easy program development and enhancement and has the flexibility to meet future operational requirements and demand for continuous improvement in fire and emergency ambulance services; and

- additional efficiency – with the introduction of the automatic call-out function at ambulance depots and mobile data terminals on vehicles for address confirmation, FSCC console operators will not have to broadcast mobilising instructions and to confirm incident addresses. Hence, the time spent by a console operator in handling an emergency call would be reduced and can be released earlier to handle the next call.

2.5.12. Console operators receive three months of training in operations of the Fire/Ambulance Service, use of the computer and other telecommunication equipment, as well as the departmental orders. Calls are classified in the Fire Services Communications Centre (FSCC) into urgent, regular emergency and EMA emergency. The designated ambulance or AAMC resource is then assigned. Currently, calls are categorized in accordance with a guideline.

2.5.13. The FSCC console operator who answers the phone and receives the request for emergency medical care, also dispatches the ambulance. Based on demand and the current volume of approximately +500,000/year the console operator has between 30-40 seconds to dispatch the Ambulance.

2.6. Initial Training and EMA II Training

2.6.1. The Fire Services Ambulance Command Training School (FSACTS) provides all ambulance training for FSD. New recruits undergo initial training here to the EMA I level. EMA I has been the standard for FSD

since 1997. About 450 ambulancemen have now completed the EMA I training.

2.6.2. New recruits receive 24 weeks of training in ambulance operations, basic firefighting, hazardous materials, emergency care, general service orders and overall orientation to the service, as well as mountain rescue. In addition they receive orientation training for the Fire Services Department and the basic structure of the service.

2.6.3. Ambulancemen who have not completed the EMA I training prior to its adoption in 1997, have been assigned to report back to the FSACTS to complete a two week refresher to earn the EMA I qualification. Currently there are approximately 250 ambulancemen of various ranks who have completed this training.

2.6.4. The EMA II training program is also conducted at the FSACTS.

2.6.5. EMA II training comprises a twenty-week period, with four weeks self-study, two weeks of a preparatory workshop, and another six weeks of self-study and the remainder of the time divided into didactic training (six weeks) and clinical practice (two weeks).

2.6.6. AED Recertification is a half-day course that reassesses the skills necessary to use the automatic defibrillator.

2.6.7. The Advanced Airway Management Course is a three day program only given to the EMA II personnel. It covers the use of advanced airways, technique and applications. EMA II personnel are required to attend a regular update for the Advanced Airway Management Course to verify proficiency.

2.6.8. The Justice Institute of British Columbia accredits the FSACTS in respect of its EMA training. They inspect the educational quality assurance and instructor training. Their visits also provide opportunities for training staff, making field observations and providing guidance.

2.6.9. Syllabus review and other changes to the clinical care training program are made by the Medical Director and the Senior Ambulance Officer for Paramedic Development.

2.6.10. Needs for change are regularly assessed and reviewed. In the longer term, it is intended that this review will be planned within a five year educational/clinical strategy plan guiding future development. Data from quality assessment will greatly assist in improving clinical care and education.

2.6.11. An assessment of the clinical requirements that patients are most in need of, will in this case yield information on clinical and educational issues

that have to be addressed. A clinical data information system, coupled with the dispatch data will provide a clear picture of types of training the ambulancemen require and will enable FSD to assess the needs of the community. Currently, this does not exist for training or for quality assurance.

2.6.12. Where practical, this information will be captured real time so that needs in training and education can be addressed in a timely manner.

2.7. Quality Assurance

2.7.1. Quality assurance is overseen by the Senior Ambulance Officer for Paramedic Development and the Medical Director. They use the following methods to assure quality.

2.7.2. Re-certification of the EMA II personnel every three years is via a two-week refresher course. Competency is then assessed by re-administering the EMA II written and practical exams.

2.7.3. As an extension of the EMA II programme, all EMA II qualified personnel receive six days of continuing medical education (CME) every three years. CME programme covers new topics of pre-hospital care and during which EMA II are removed from active ambulance duty and report to FSACTS.

2.7.4. The Medical Director provides instruction on a variety of CME topics selected by him. These include clinical review, current topics of interest and issues that have been identified during quality assurance surveys.

2.7.5. Field supervision and observation of the paramedics on EMA II ambulances is also carried out. Skills and performance of the EMA II personnel are assessed. Simulated ambulance scenarios are also used to identify training needs. These in the field exercises provide the opportunity to give immediate feedback and reinforcement to ensure competency. Outcomes are recorded using a standardized form.

2.7.6. The training staff also collect instant feedback from patients regarding performance and record outcomes using a standardized questionnaire.

2.7.7. Every six months, call reports are sampled over a 2-week period. Demographic data is collected as well as compliance with established protocols for assessment, diagnosis categorisation, treatment and medication, etc. Information is analysed by the Medical Director to ensure protocol compliance and to identify opportunities for improvement.

2.7.8. Questionnaires have been distributed to HA's staff at the various A & E departments. With limited resources, this process has not been carried out

on a regular basis. Their suggestions on how to improve the service and the strengths/weaknesses of the paramedics are also solicited.

2.7.9. The current staff and service configuration are inter-dependant. The EMA II Instructors provide quality assurance. When deficiencies are detected, the training staff provides feedback to the ambulancemen. Medical control is provided off-line via the form of written medical protocols.

2.8. Human Resource Issues

Recognition of Paramedics

2.8.1. EMA II qualified ambulancemen currently receive a special allowance equivalent to 10% of the GDS(R)1. This allowance fulfils two functions. Firstly, it recognizes the ambulancemen's capabilities in respect of patient assessment, patient care and reporting on patient history. Secondly, it provides an incentive to Ambulancemen to maintain their EMA II qualification through regular refresher training and recertification.

2.8.2. Payment of this allowance dates back to 1995 and was recommended by the Standing Committee on Disciplined Services Salaries and Conditions of Service, albeit as a temporary measure.

3. NEED FOR A NEW PAS FOR HONG KONG

3.1. Growth in demand

3.1.1. FSD is facing a significant challenge at present with a surging demand for ambulance services.

3.1.2. The latest data from Hong Kong Planning Department's Working Group on Population Distribution, concerning population growth, shows an 9% increase in the population in Hong Kong from 1998 projected through to 2006 (in 1998 6,645,600 people versus in 2006 7,239,320 people).

3.1.3. Census and Statistics reports that Hong Kong's population is living longer (mean age for men 77.2 years and for woman 83.8 years), shows a population that will have an ever increasing demand for service. Figures released from the World Health Organization shows that in well developed regions of the world, the greatest demand in health care occurs in the older patient population, who require more intensive resources for health care and that the greatest expenditures for health care occur in the last six months of life. Historic records from HA together with the sampling data provided by FSD also provide an insight into the contribution of an aging population to this growth in demand. Table 3.1 clearly shows that the major users of ambulance services fall within the "65+" age group.

Age Group	0-3	4-7	8-11	12-17	18-24	25-34	35-44	45-54	55-64	65+
Average Ambulance Calls/Head	2.5%	1.9%	1.8%	3.4%	5.3%	4.2%	3.6%	4.3%	6.5%	28.7%

Table 3.1 Average Ambulance Calls/Head of different Age Group

3.1.4. In summary, growth in Hong Kong's population and in particular the aged (65 years+) will continue to drive the demand for service.

3.1.5. FSD is operating in an environment of increasing demand and based on world trends for ambulance services could expect this trend to continue or even accelerate. Table 3.2 shows the annual EMS Responses per head at three major cities for 1999. New York's calls per head of population were almost 2.5 times that of Hong Kong.

City	Pop'n (Millions)	Populated Area (Sq Km)	Pop'n/ Sq Km	EMSResponses/ Year	EMS Responses/ 1000 Pop'n
Hong Kong	6.72	424	15,850	484,217	72
London	7.19	1,611	4,462	704,052	98
New York	7.32	800	9,153	1,250,000	170

Table 3.2 Comparisons of EMS Responses for International Cities

3.1.6. Attachment 1 summarises information gathered from the metropolitan ambulance services of London and New York. It appears that the number of calls for EMS in New York is now relatively stable. FDNY charges more than US$300 for patient transports to hospitals and the health authorities have introduced various demand management initiatives such as wellness programmes and outreach clinics. The number of calls for LAS is still on the rise although year-on-year increases appear to be less than that of Hong Kong.

3.1.7. Figure 3.3 shows how the number of calls per unit population in Hong Kong is increasing exponentially. Given the relatively low rate of calls per unit population when compared with other developed economies, it seems reasonable to expect that - without some obvious intervention such as the introduction of charging for response - the rate of calls per unit population in Hong Kong will continue to increase at similar rates over the next 10 to 15 years. With the prevalence of cardiac disease, respiratory disease, cerebrovascular disease and diabetes as some of the leading causes of death/illness in Hong Kong, the demand is expected to continue to rise for ambulance services.

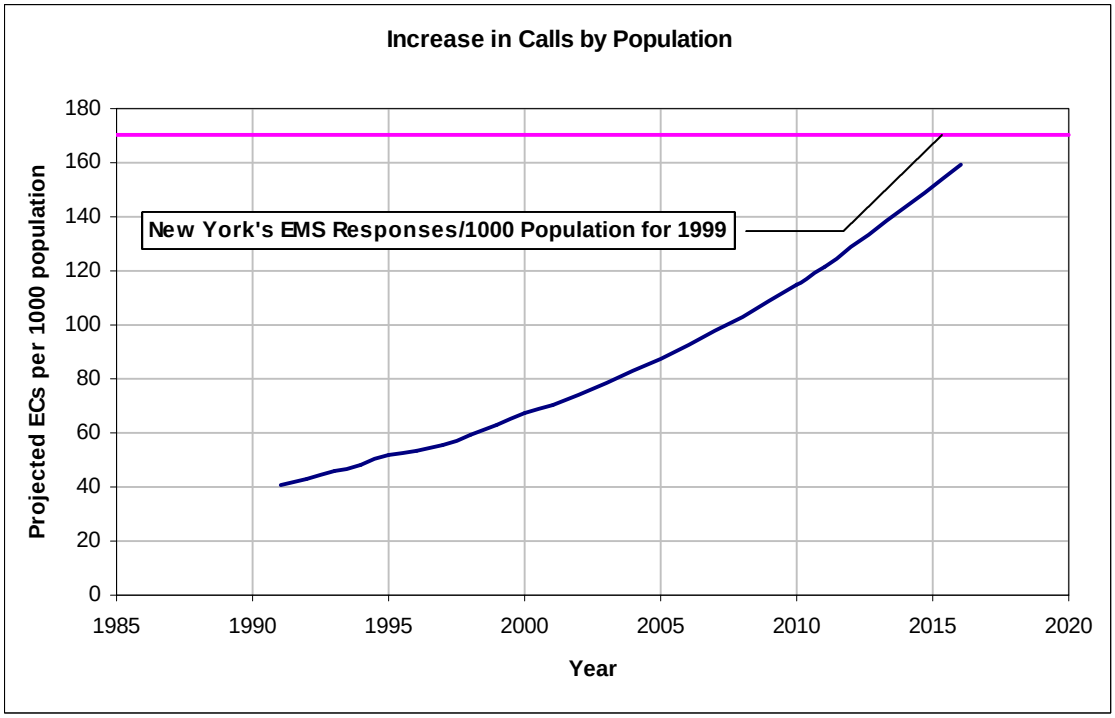

Figure 3.3 Historic and projected number of Emergency Responses per 1000 population by year. Historic values derived from recorded information. Projected values derived from statistical analysis of recorded information extrapolated forward.

3.1.8. In overall numbers, Year 2000 Emergency Responses were in excess of 519,000 per annum (43,000 per month). Table 3.4 and figure 3.5 show the forecast number of Emergency Responses by year derived by using the

projected "calls/1000 population" and the forecast population. This indicates that call volumes will increase to around 543,000 by year end with more than 45,000 calls per month, and 609,000 by 2003 – the earliest time at which additional resources can be made available. This surging increase is one of the more significant issues confronting Ambulance Command at this time. Details of the projected values are contained in Attachments 2 and 4.

Year	Emergency Calls	Urgent Calls	Total Calls	Ambulances
2006	669,428	60,000	729,428	292
2005	623,337	60,000	683,337	275
2004	584,737	60,000	644,737	263
2003	548,526	60,000	608,526	251
2002	514,559	60,000	574,559	241
2001	482,694	60,000	542,694	231
2000	459,658	59,614	519,272	210
1999	421,146	63,071	484,217	208
1998	394,493	69,250	463,743	189
1997	367,064	67,574	434,638	179
1996	347,607	65,086	412,693	181
1995	317,749	63,873	381,622	169

Table 3.4 - Surging Emergency Calls (Note: Ambulances for 2000 beyond are those needed to meet RT Pledge)

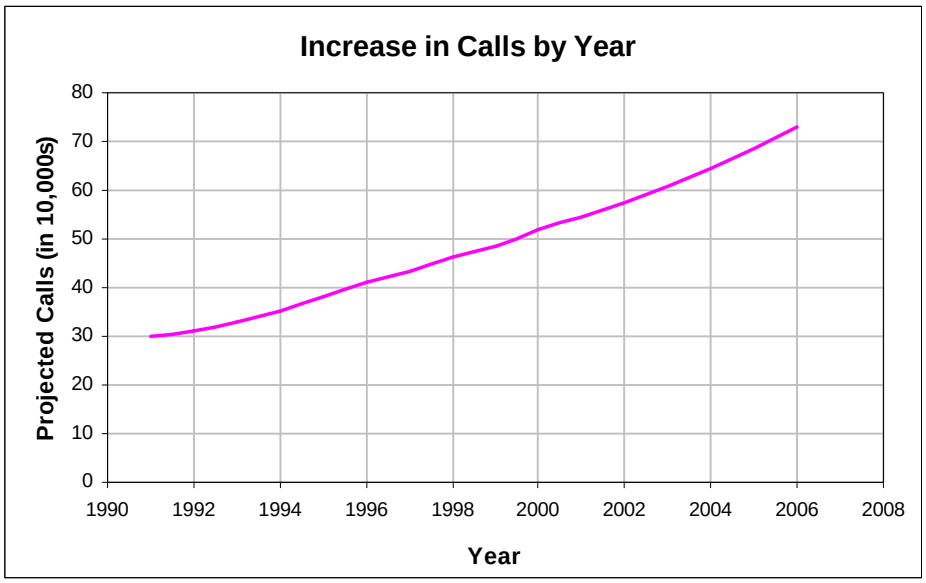

Figure 3.5 Historic and projected number of ECs by year. Projected values derived from Government's population forecasts together with projected calls/head of population.

3.1.9. The overall response time performance for ambulance services has reduced from 93.30% in 1999 to 92.0% in August 2000, and 92.67% for the whole 2000. A detailed analysis by location of the more than 520,000 calls logged in 2000 has provided insight into the current capacity and demands for ambulance services. By using the new computer based model developed under this Study, it has been estimated that FSD's capacity is currently below that needed to respond to calls while maintaining the pledged response time performance targets across Hong Kong throughout the day in 2001. It is unlikely that response time performance will be maintained at the FSD's pledge of 92.5% in the forthcoming years without the commitment of additional ambulances resources.

3.1.10. To forecast the resources requirement for maintaining the FSD's pledge, an appropriate parameter which can effectively correlate the influence of the environmental and operational factors on the response time (RT) performance is needed. With the experiences from other international cities such as London and New York, we have adopted the Unit Hourly Utilization (UHU) as the means of predicting the future resources requirement. UHU is the factor that measures the proportion of a shift that an ambulance is responding to ambulance calls. The response commences from ambulance being mobilized and continues through to completion of the ambulance services (usually) at the hospital. The required UHU is determined by many different factors including the call volume, the performance of the road network, the on-scene treatment time and hospital coverage. Low UHU means higher ambulance availability. With the overall RT performance determined by travel time and the availability of ambulances when calls are received, UHU has a direct impact on the RT Performance. The cause and effect relationships of these factors on utilization and in turn on overall RT Performance are:

Ambulance Calls increased	Total service time increased	Ambulance Utilization increased	Ambulance availability reduced	Response Time lengthened
Road Network improved	Travel time to scene shortened	Ambulance Utilization decreased	Ambulance availability improved	Response Time shortened
Skill level enhanced	On-scene treatment time increased	Ambulance Utilization increased	Ambulance availability reduced	Response Time lengthened
Hospital coverage improved	Travel time to hospital shortened	Ambulance Utilization decreased	Ambulance availability improved	Response Time shortened
		Max. UHU Required		**Target RT Performance**

3.1.11. The required UHU to maintain RT Performance mirrors the overall impact of these various factors. Using workload projections (refer to Attachment 2 for the number of ambulance call responses through to 2011) and the

optimum UHU corresponding to the FSD's 92.5% RT Performance Pledge, FSD can determine the number of ambulances needed for each year. The following simple expression explains this approach:

$$\text{No. of Ambulances required} = \frac{\text{Total Workload}}{\text{Workload taken by each ambulance}}$$

Total Workload: Determined by total calls to be handled AND by average time for each ambulance call

Workload taken by each ambulance: Determined by UHU required to ensure pledged RT Performance.

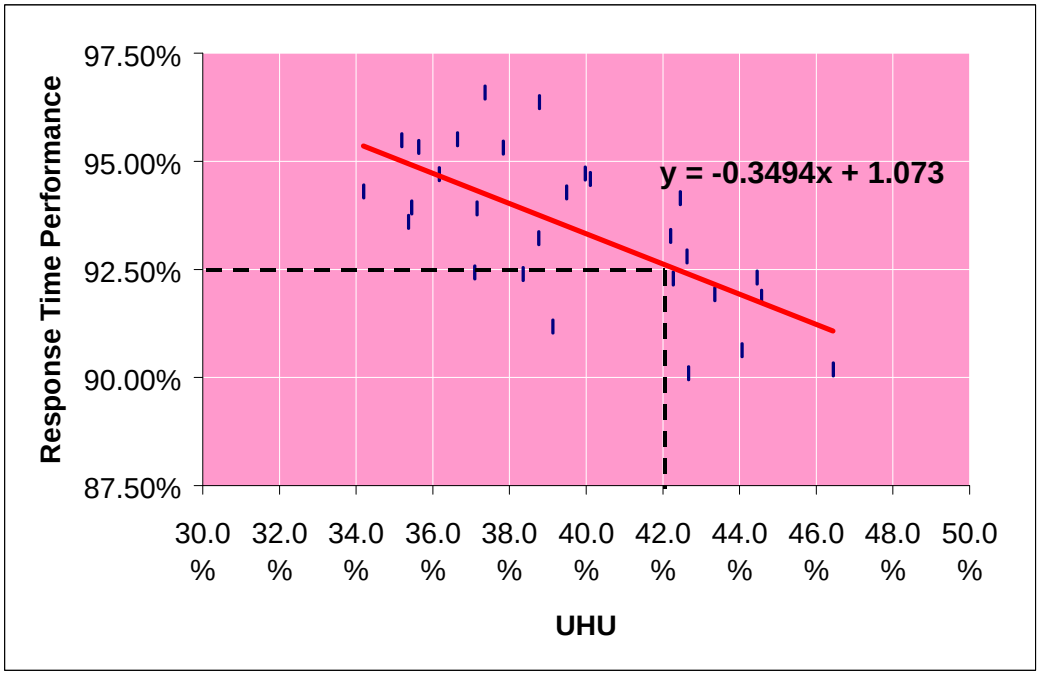

Figure 3.6 Plot of Response Time Performance Vs UHU with each point representing the performance of an operational division of FSD. Data from the low utilized depots such as in strategic locations have been excluded from this analysis (see Attachment 4-3).

3.1.12. Figure 3.6 above shows the direct relationship between Response Time Performance and the Unit Hourly Utilization (UHU) of FSD's operational divisions. Each data point represents the calls for one of FSD's operational divisions for a quarter of Year 2000. The straight line on the graph shows the direct relationship between UHU and RT Performance as derived by a linear regression on the data points. UHU must be maintained below 42% in order to ensure achievement of the 92.5 % RT Performance Pledge in each of the operational division. LAS provide a similar plot for their services. In their case, their shortfall of resources meant a higher UHU and slower responses.

3.1.13. FSD needs a long term strategy for dealing with the continuing growth in demand. The adoption of UHU as the basis of determining the needed resources with a 42% benchmark will ensure RT performance can be maintained.

3.1.14. UHU is very close to that of ambulance utilization except that for UHU only a portion of the ambulance's utilization - from the time the ambulance is mobilised through to completing the delivery of the patient to the hospital - is measured. The other periods when an ambulance is utilized are not recorded. The calculation of UHU takes into account only the time engaged in responding to ambulance calls. The verification of UHU does not include the time for return to base after responding to incidents; lunch; checking of ambulance after changing watch; replenishment of medical supplies, cleansing of ambulance compartment and disinfection of equipment after each ambulance call; refilling of fuel; daily training; drills and test turn-out; giving police statement and handling unforeseen circumstances such as their ambulance breaking down and being involved in traffic accident. In fact, ambulancemen are fully engaged in operational duties and daily routine throughout their shifts. They have little inactive time in their daily working schedule.

3.1.15. The UHU parameter is used in USA, UK and Australia and is not new to FSD. The concept is very relevant to Hong Kong with its surging increase in calls for ambulance services with RT performance primarily determined by availability of an ambulance and by the travel time. Ambulances are only available if they are not in use. UHU is clearly determined by the number of and the location of calls, road conditions, skill levels of ambulance personnel. UHU is also affected by hospital coverage as the long travel time from patient pick-up to hospitals will ties up the ambulance and delay its availability to respond to new calls. The road conditions will determine the travel time and clearly an effective distribution of the ambulance depots is also very important. Hong Kong has a well maintained road system – so the issue is more one of traffic congestion or traffic conditions.

3.1.16. The availability of ambulances (at all depots) is the most important factor affecting RT performance and this is best measured through UHU. UHU is easily measured and recorded (and aggregated) and provides a very reliable indicator by which to determine the amount of resources needed by FSD.

Urgent Calls

3.1.17. Urgent calls (UC) account for around 12% of the total calls attended by the emergency ambulance fleet. Analysis of "UC" calls throughout 2000, shows that more than 80 percent of these calls arise from particular hospitals and during a typical working week - 9:00 am through to 6:00 pm for Monday to through to Friday with a half day on Saturday.

3.1.18. Unlike the number of Emergency Calls (EC) with its steady year-on-year growth, the number of UC calls has shown some fluctuation but has been generally steady at around 60,000 per annum. Most of the UC call

transfers are intra-region with a small proportion across regional boundaries. Examples of the latter include transfers to Grantham, Prince of Wales and Rutonjee Hospitals. There was a decrease in overall transfers in 2000 which might reflect the availability of wider specialized services within acute hospitals.

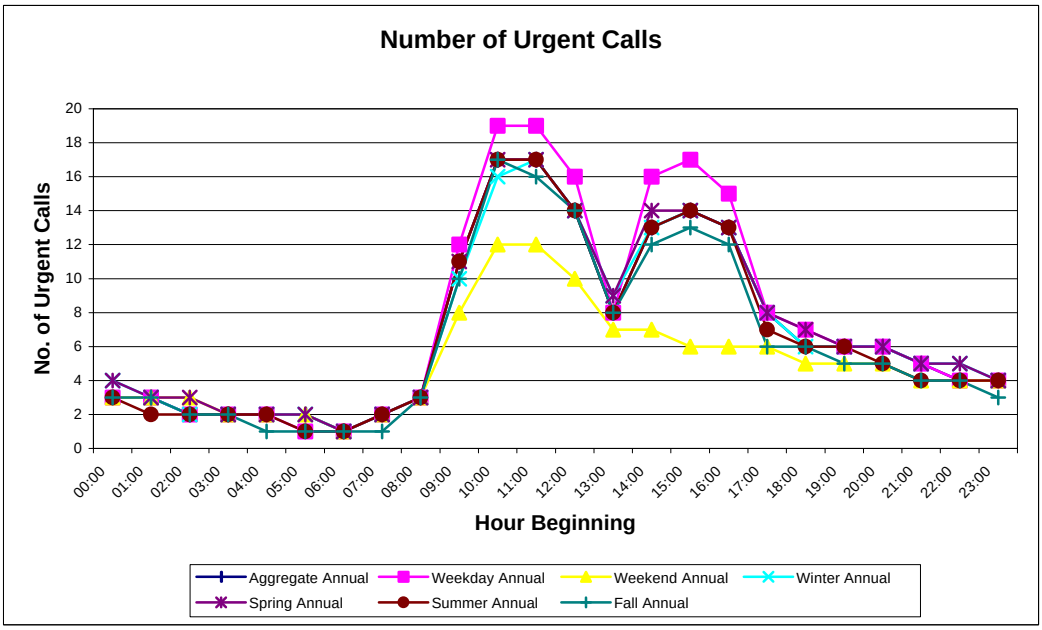

Figure 3.7 Number of Urgent Calls

EMA Calls and Mismatch rates

3.1.19. Within the overall Emergency Call demand is the sub-set of demand for EMA II responses. These are increasing at a faster rate than that of all Emergency Calls. Between June 1996 and March 2000 the demand for the EMA II responses increased by 106% whereas demand for all Emergency Calls increased by 36%. The significance of the demand issue becomes apparent when consideration is given to the need for Ambulance Command to address both levels of demand growth concurrently.

3.1.20. Table 3.8 shows the demand for EMA Responses in 2000 together with the actual EMA Responses. Mismatch refers to a response to an EMA call by ambulance resources without an EMA II capability.

Region	Emergency Calls	Request for EMA Response	% of EC Calls	Actual EMA Responses	Mismatch %
HK	99,213	19,795	20%	12,600	36%
KL	177,667	41,112	23%	27,988	32%
NT	182,778	37,497	21%	27,170	28%
Totals	459,658	98,404	21%	67,758	31%

Table 3.8 - Mismatch rates by Region for 2000

3.1.21. Upgrading all ambulances to EMA II level will eliminate this mismatch.

Response times

3.1.22. Achievement of the FSD's performance pledge of responding to at least 92.5% of calls within 12 minutes is under pressure due to:

- Growth in calls
- EMA II training program requiring the standing down of operational staff as trainers and trainees,
- Rising expectations of the community

3.1.23. Analysis of response time performance shows that the early morning period commencing at 7:00am when the Command is on Night Shift and at half strength prior to the arrival of the day shifts at 8:30 am, and the evening period (with the Command again on Night Shift) from 8:30pm through to 11:00 pm is when response time performance suffers.

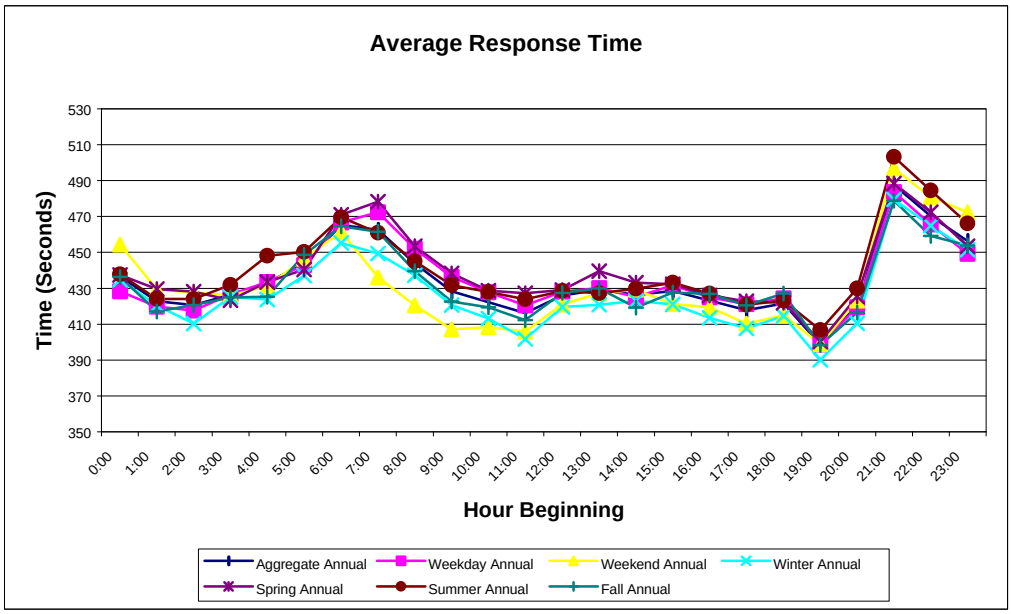

Figure 3.9 Average Response Time by Hour (Performance drops at beginning and end of night shift with its reduced manning)

3.1.24. Demand for service increases early in the day, with the heaviest volume occurring at 9:00 am and starts to taper off after 6:00 pm. By 8:30 pm, the number of calls is at about 80% of the day time levels. At this time, the day shift finishes reducing the number of ambulance available by one half. It is during this peak demand period that the longest response times are recorded and the night shift ambulance fleet is heavily utilized. Data in Figure 3.9 and Table 3.10 support this argument.

Region	Division	Depot/Station	Type	Day Shift	Night Shift	EC Calls Y2000	UHU	Day UHU	Night UHU (9:00pm to 12:00pm)
HK	W	Pokfulam	Depot	6	3	13,325	37%	37%	52%
HK	E	Sai Wan Ho	Depot	6	4	15,614	39%	40%	50%
HK	E	Morrison Hill	Depot	6	3	14,134	39%	42%	56%
HK	E	Chai Wan	Depot	4	2	10,167	42%	44%	61%
HK	E	North Point	Fire Station	2	1	5,307	44%	40%	62%
HK	E	Tung Lo Wan	Fire Station	2	1	5,063	42%	38%	57%
HK	E	Central	Fire Station	2	1	4,918	41%	38%	56%
K	W	Ma Tau Chung	Depot	6	3	16,573	46%	47%	62%
K	W	Cheung Sha Wan	Depot	6	3	16,200	45%	45%	58%
K	W	Ho Man Tin	Depot	6	3	13,804	38%	39%	60%
K	W	Mong Kok	Fire Station	4	2	13,689	57%	48%	72%
K	W	Yau Ma Tei	Depot	4	2	12,418	52%	43%	74%
K	W	Pak Tin	Depot	4	2	11,408	48%	45%	67%
K	W	Tsim Sha Tsui	Fire Station	2	1	5,151	43%	36%	67%
K	E	Wong Tai Sin	Depot	8	4	23,934	50%	57%	63%
K	E	Ngau Tau Kok	Depot	6	3	19,977	56%	40%	81%
K	E	Lam Tin	Depot	6	3	15,083	42%	46%	55%
K	E	Shun Lee	Fire Station	2	1	5,915	49%	42%	63%
NT	S	Tsuen Wan	Depot	6	3	16,030	45%	42%	58%
NT	S	Lei Muk Shue	Depot	6	3	14,614	41%	42%	58%
NT	S	Kwai Chung	Fire Station	2	1	6,288	52%	41%	65%
NT	W	Tuen Mun	Depot	4	2	12,111	50%	48%	60%
NT	W	Castle Peak Bay	Depot	4	2	8,934	37%	41%	57%
NT	E	Tin Sum	Depot	4	2	9,413	39%	39%	55%
NT	E	Sheung Shui	Fire Station	2	1	5,640	47%	40%	61%

Table 3.10 Unit Hourly Utilization for 9:00pm to 12:00pm in Year 2000 and for the day shift (values higher than 42% are considered overloaded.)

3.1.25. Table 3.10 above lists the more heavily loaded depots/stations. This group currently accounts for more than 65% of Hong Kong's emergency calls. Overall this group has a UHU of over 45%. This is high as the analysis of RT Performance Vs UHU shows that a UHU in excess of 42% is likely to result in a RT Performance below FSD's performance pledge of 92.5% achievement of the 12-minute response.

3.1.26. Such a value for UHU is also consistent with information on UHU levels available from the USA. While there does not appear to be an internationally adopted norm for UHU, Mr Jack Stout the originator of various management concepts used by the US EMS industry including the concept of unit-hour utilization writes in "*Principles of EMS Systems*" –

American College of Emergency Physicians:

"*Where response time requirements are stringent, the highest overall UHU ratio achieved in urban settings ranges from 30% in more difficult-to-serve communities to as high as 45% in easier-to-serve communities.*"

3.1.27. Communications with the Fire Department New York and London Ambulance Services also revealed the impact of high UHU on Response Time Performance. (See Attachment 1)

3.1.28. FSD's high UHU can only be addressed by providing more ambulances in the urban area to meet the emergency calls. Table 3.11 shows the surging increase anticipated in EC to depots in the urban area, the forecast UHU of ambulances at their depots, and expected deterioration in the corresponding Response Time Performance if additional resources cannot be mobilized. It also shows the number of additional ambulances needed to maintain the Response Time Performance at FSD's pledged level.

Year	*Total EC and UC*	*UHU of Urban Area*	*Response Time Performance with no additional resources*	*Additional ambulances needed for RT Performance of 92.5%*
2002	574,559	46.5%	91.0%	29
2003	608,526	50.3%	89.7%	39
2004	644,737	54.3%	88.3%	51
2005	683,337	58.6%	86.8%	63
2006	729,428	63.3%	85.2%	80

Table 3.11 Additional Ambulance Resources required for achieving 92.5% Response Time Performance in high demand locations in the urban area

3.1.29. There is a deficiency in resources particularly during the early evening with few diminished resources and a large number of requests for emergency assistance. While in the day, some of the peak demand is addressed by the AAMC, the AAMC are not deployed during the night shift with a corresponding reduction in capacity.

3.1.30. During 2000, the UHU across the whole fleet was 35%. With the need to distribute resources throughout the SAR, the UHU Rate at some of the depots is unavoidably low (Table 3.12 shows how low the UHU rates are at some of these depots). It is clearly essential that proper ambulance cover is provided in remote locations and in specific locations such as along highways and at the International Airport. On the other hand, the UHU Rate at some of the depots in the urban area far exceeds the benchmark of 42% (see Section 3.1.12). If we look at those more busy depots accounting for 65% of Hong Kong's Emergency Calls (see Table 3.10), the overall UHU Rate rises to more than 45%.

		Depot or Fire Station	EC Calls Y2000	Response Performance	UHU Rate
HK	W	Tai O Sub-division	439	62.92%	5%
HK	W	Sandy Bay (Mt Davis)	7,509	81.18%	33%
HK	W	Lamma	339	89.36%	4%
NT	S	Sham Tseng	1,937	91.25%	16%
HK	E	Chung Hom Kok	2,358	94.62%	20%
HK	W	Peng Chau	487	95.04%	6%
HK	E	Victoria Peak	1,748	95.24%	15%

Table 3.12 Response time performance for 2000 for some depots with low utilization rate. (Slow response time in some cases arises from remoteness of caller and long travel distance.)

3.1.31. High UHU rates result in irregular response performance and the need to frequently "move up" ambulances to fill voids in individual depot. Typically achievement of the Response Time Performance Pledge (12 minutes) for depots with high UHU is in the range of 88% to 92%. Relatively lower UHU rates mean more consistent response arising from availability of ambulances. Table 3.13 illustrates the above observations.

Region	Division	Depot/Station	Type	Day Shift	Night Shift	EC Calls Y2000	UHU	RT Performance
K	W	Pak Tin	Depot	4	2	11,408	48%	88.88%
NT	E	Sheung Shui	Fire Station	2	1	5,640	47%	89.07%
K	W	Ma Tau Chung	Depot	6	3	16,573	46%	92.33%
HK	E	Central	Fire Station	2	1	4,918	41%	93.78%
HK	E	Morrison Hill	Depot	6	3	14,134	39%	94.37%
NT	W	Castle Peak Bay	Depot	4	2	8,934	37%	94.36%
HK	W	Pokfulam	Depot	6	3	13,325	37%	95.54%
NT	E	Tai Po	Depot	8	4	16,839	35%	96.08%
NT	E	Shatin	Depot	8	4	16,623	35%	97.17%
NT	S	Tsing Yi	Depot	6	3	11,010	31%	97.63%

Table 3.13 Response time performance for 2000 for depots with various utilization rates.

3.2. Full Provision of PAS

3.2.1. FSD is committed to providing PAS on all ambulances throughout Hong Kong. This development needs to take into consideration all relevant factors and constraints including all resource implications, the skill level of PAS, the related training issues, ongoing response time performance of ambulance service, quality assurance, procedures, information systems, equipment, accommodation and logistic support.

3.2.2. FSD aims to implement the PAS within as short a time as is realistic. Each EMA II course takes 20 weeks to complete and the Ambulance

Command's plan is to train the NCO's without EMA II, a total of more than 500 as soon as possible

3.2.3. Based on a preferred maximum class size of 24, a total of at least 23 EMA II courses will be needed. On top of this program there is re-certification, continuing medical education (CME) days and initial recruit training also needs to continue.

3.2.4. This is a huge commitment by FSD and its staff and cannot be met without support. Clearly, the training program cannot jeopardize or put at risk the current response performance and sufficient lead-time is needed to secure the needed resources.

3.2.5. Releasing the required numbers of NCO's for an accelerated EMA II training program will be challenging. There is insufficient staff to meet the roster and FSD will only be able to meet the necessary deployment in the short term by using off-duty ambulancemen. This will require the cooperation of the ambulancemen and additional financial resources to compensate the ambulancemen for the additional shifts worked. Additional training instructors will also be needed for the accelerated EMA II training.

3.2.6. FSACTS can currently accommodate only one EMA II program at a time. The capacity of FSACTS is critical to Ambulance Command's future as the Ambulance Command not only needs to train its current workforce but also will subsequently need to provide a skills maintenance program and introduce further training programs to continue to develop paramedic's knowledge and skill base.

3.2.7. If providing PAS on all ambulances is implemented, it will not be possible to conduct all the ambulance training at the Fire Services Ambulance Command Training School (FSACTS) at Ma On Shan. By conducting the initial recruit training at the Fire Services Training School (FSTS) at Pat Heung, the FSACTS may, in the short term, be reserved for the EMA II program – basic training, CME and re-certification. This will require some temporary alterations and additions to FSACTS estimated to cost around HK$1.0 Million. However, this approach will require a relatively small training team to be posted to FSTS for the initial training of new recruits and hence create some logistical problems. For this reason it is considered to be a temporary solution only.

3.2.8. One alternative option would be to utilize classrooms either within hospitals or tertiary institutions. This is not a practical solution as it would create more significant logistical problems for the relatively small training team unless all training was moved to a new centre.

3.2.9. Another possible option is outsourcing of the entire training programme. There are however a number of problems with this approach. Firstly,

Government will have difficulties in identifying an appropriately responsible and qualified local agent that is willing to make the necessary long term commitment to take over the whole paramedic training programme. Availability of external agents is limited and outsourcing to overseas agents such as JIBC, Canada is not favoured as the language barrier imposes inconvenience in the delivery and the effectiveness of training programmes.

3.2.10. The degree of staff acceptance is extremely important and Government's past experience was that there was significant level of staff dissatisfaction with outsourcing of the training. After achieving full PAS, maintenance and enhancement of skills through recertification, continual medical education and advanced training programme (e.g. advanced airway management) will be needed. Outsourcing will therefore restrict FSD's flexibility in being able to introduce new skills or protocols and being able to specify new outputs and performance. Costs will be higher particularly when changes are needed and will therefore not be cost-effective.

3.2.11. The most significant issue however is the unavoidable delay to the achievement of the full PAS since the lead-time required for outsourcing could easily be more than twelve months. This would comprise the initial procurement of the external agent and then their taking time to recruit instructors tailored to the specific needs of EMA II training and to establish appropriate training facilities.

3.2.12. The existing arrangement has already accommodated active participation of external agent (HA) in paramedic training. FSD recompenses HA for their contribution to didactic training and clinical practice for EMA II. Such hybrid arrangement i.e. utilizing both internal and external resources has enabled FSD to capture the benefits of outsourcing but retain the flexibility in specifying outputs and monitoring performance.

3.2.13. In the longer term, FSD should seek to develop close links with the hospitals and tertiary institutions to enhance the capabilities and development of the FSACTS and its programs. If the local Universities are not prepared to provide the guidance and assistance, overseas Universities could be approached. This is unlikely to be required, however, it is recognized that local Universities might consider partnering with overseas institutions with developed paramedic programs. There will be many external parties with the skills and experience that could assist FSD in developing and delivering its courses.

3.2.14. The training programme that is recommended involves 192 trainees per year. This is 8 separate groups of 24 each. Less than 192 would delay implementation of full PAS and inefficient use of training resources. Increasing number beyond 24 will require more training resources. The 192 limit is efficient and economical. The details of these training

proposals are described in more detail in Sections 4.2 and 4.4. In addition, with the pressure on FSD to maintain RT performance in the face of growing call demand, it would not seem realistic to attempt to train more than the 192 EMA II's per year.

3.2.15. In order that the full PAS be provided as soon as practical, it is necessary to:

- Provide for greater involvement of Medical Director – initially, one additional half time equivalent, and by April 2003 a further half time equivalent,
- Advance recruitment plans to provide sufficient training reserve for releasing both trainers and trainees to EMA II training program;
- Temporarily transfer the initial recruit training to Pat Heung FSTS to release space within the FSACTS for the additional lecture rooms, course rooms and offices;
- Carry out temporary modifications to FSACTS for the additional lecture rooms, course rooms and offices;
- Agree schedules with ambulancemen for returning from off-duty periods to fill the duty roster;
- Train appropriately skilled EMA II ambulance officers to provide an enlarged and competent EMA II training resource;
- Liaise with the Hospital Authority to investigate their involvement in a widened EMA II training program;
- Permanently extend FSACTS to accommodate the long term training needs of both the EMA II training and the initial recruit training for new recruits.

3.3. Skill Level

3.3.1. The value of the future PAS will depend on the quality of service it provides to the community and other health agencies. For the full potential of the PAS to be reached, it will be necessary to develop both its clinical and management capabilities.

3.3.2. The EMA II's and other ambulancemen provide good consistent care within the skill levels available. The ambulancemen crews function well together in the three-man ambulance environment. EMA II patient care is provided in accordance with off-line medical protocol which are predefined and agreed by the Medical Director.

3.3.3. The EMA II qualified supervisor provides patient with paramedic care and immediate direction and support to his crew members on-scene. In doing this, he works closely with his crew members and relies on their assistance while rendering paramedic treatments to patients, such as spinal management, defibrillation, etc. Through this working relationship, the other crew members are given opportunities to develop their clinical

experience. In term of clinical knowledge, basic paramedic skills and theories are incorporated into the syllabuses of general and refresher training for ambulance personnel.

3.3.4. Development of management and clinical skills should be addressed separately in order to provide the necessary focus for both of these skill areas. The ambulancemen will benefit from specific and separate training programs each focusing on one or other of these skills. The benefit will be higher performance levels in terms of both the management of the ambulance system and the patient care it provides.

Paramedic qualifications

3.3.5. Internationally, there are many different levels of paramedic qualifications. The number of hours training varies from one jurisdiction to another and is usually determined locally to satisfy the relevant medical and health care authorities. In Hong Kong, this will be the Hospital Authority.

3.3.6. Paramedic Ambulance Services also usually have boards of studies to assess external and off campus qualified applicants. Hong Kong as an international city needs to develop its own qualification, appropriately accredited by local universities. This would be a major step in matching FSD's Ambulance Services more appropriately to Hong Kong's health care and related educational environment.

Pharmacology skills

3.3.7. There is a need for the treatment regime of Hong Kong paramedics to reflect the needs of the community. Hong Kong's illness profiles are similar to other large communities in developed countries - cardiovascular and respiratory episodes.

3.3.8. A review of the EMA II qualification shows that with minor adjustments, trainees could be introduced to a wider treatment regime. For example, the knowledge base of cardiac function needs to be altered very little to allow for the introduction of Adrenaline. Adrenaline might then be used for the treatment of both allergic reaction and cardiac arrest. With some additional training, paramedics could provide further relevant treatments to the community.

3.4. Specialized Ambulance Teams for Pre-hospital Care

Specialized Service Centers

3.4.1. The Hospital Authority will move towards further consolidation of specialty services. There will be increasing rationalization of services

through development of specialized centers and service networks. Examples of such 'specialized service center' include development in the field of neurosurgery, cardiothoracic surgery, burns, traumatology and neonatology. With this approach, it would be desirable for selective patients to be transported to the nearest appropriate hospital. Similarly, when patients are initially transported and treated at a hospital without the specialized service, and are found to have severe or unique conditions – there will be a need to transport them to a specialized service center.

3.4.2. Specialized service centers would have specialized expertise and facilities available that the typical acute hospital may not have. Some examples of what such a center could have include cardiac bypass machines to do immediate cardiothoracic surgery, extra blood on hand, a neurosurgeon is available immediately in house, 24 hours a day, 7 days a week are just some of the examples of what is required.

3.4.3. This approach is consistent with international practices. For example in the USA, the American College of Surgeons requires that the number of patients that a trauma center needs to treat in order to maintain proficiency as a level one trauma center is 1200/year. The American College of Cardiology states that a hospital providing cardiac bypass surgery to patients needs to treat 600 to maintain proficiency.

Critical Care Transport Teams

3.4.4. It is impractical to consider providing specialized teams throughout Hong Kong to respond to patients with selected conditions cardiac, pediatric, burns, and trauma. Call screening and telephone triaging will not be able to reliably identify patients needing specialized pre-hospital teams. The upgrading of all FSD's ambulances to an EMA II level of service will ensure all patients receive advanced level care. The EMA II paramedics will identify the patient's condition and decide according to explicit guidelines which center to transport them, or whether they are too sick to withstand transport directly to the specialised service centre. Obviously, to achieve effective patient diversion, there should be an effective communication system to enable EMA II paramedic to seek on line advice and assistance from the specialized service centers.

3.4.5. As the concept of specialized service center and hospital networking is consolidated, there will be a need to transport patients needing the higher level of service from individual hospital. In some cases this will give rise to the need for special transport by a critical care transport team. Patients may need access to specialized technology such as:

- Patients on balloon pumps needing transport to cardiac centres for surgery or advanced treatment

- Trauma and burn patients who are on ventilators, being transported to trauma and burn centers for surgery

- Patients receiving medications via special IV lines and who need monitoring of blood pressure/vital signs.

Hospital Diversion

3.4.6. If a patient is identified by the paramedic as having a life threatening, time-dependent condition, such as a multi-system trauma, there will be a need for immediate definitive care. On-scene paramedics will identify those patients who should be transported to a specialized service center and those to be taken to the nearest hospital. The paramedic will evaluate the anatomic, physiologic and in the case of trauma/burns, the mechanism of injury. The paramedic will assess the patient on-scene and then triage ('divert') the patient to either the nearest hospital or to the specialized service center. Such arrangements for hospital diversion are pending the availability of an effective communication system and of the clearly defined guidelines yet to be prepared by HA in consultation with FSD.

HAZMAT

3.4.7. Transportation of freight including hazardous chemicals puts the population at risk and poses special problems for the Ambulance Command. The need for a HAZMAT Team is evident.

3.4.8. Patients injured in a hazardous chemical spill may need to receive a gross decontamination on scene and a more thorough decontamination at the receiving hospital. Treatment will begin during the gross decontamination, with ambulance personnel using specialized breathing apparatus and wearing protective garments to provide treatment. Treatment may entail the use of medications and advanced airway procedures currently not provided by the Ambulance Service.

Other Emergency Situations

3.4.9. With the highly active construction industry in Hong Kong, there is high risk of construction accidents such as building collapses, confined space incidents such as trench collapses.

3.4.10. Trench rescue, building collapses and confined space incidents not only present hazardous operating environments but also if combined with crush type injuries, now present unique challenges in providing care (Kobe and Mexico City earthquakes are examples of pre-hospital ambulance systems not equipped to deal with patients who have crush

type injuries). These patients will frequently need to receive therapies and medications not normally provided by the Ambulance Service.

3.4.11. It is noted that FSD maintains a Special Rescue Squad and that this is trained to perform search and rescue in respect of major disasters both in Hong Kong and overseas.

3.5. Mobilisation and Communication

3.5.1. The FSCC provides the access point, the dispatch of ambulances and the collection of data, all of which directly determine the performance of the PAS. It is an important element of FSD's capability in providing ambulance services.

3.5.2. Responsibility for implementing the planned improvements in the FSCC lies with the Project Team of the Third Generation Mobilising System (TGMS). FSD's ambulance services have complex needs in respect of the TGMS and it is important that the Ambulance Command plays a key role in the implementation of the TGMS. FSD has undertaken an objective review of the available options with regards to call taking, dispatch, including the dispatch criteria, call triaging and the subsequent impacts on their provision of ambulance services. The TGMS contract documents provide extensive coverage of the system specification related to ambulance operations.

3.5.3. The TGMS is now in the preliminary detailed system design stage and all system specifications for the hardware and software will be finalized shortly. It is therefore important that the Ambulance Command carefully study the TGMS Contract documents and provide feedback and constructive comments on its system specifications to ensure the most effective outcome. .

3.5.4. For instance, in respect of call taking, obtaining additional detailed information from the caller may well facilitate the ambulancemen responding with more appropriate equipment to the patient's side. This is especially crucial when the ambulance crew have to respond to patients remote from where the ambulance is parked.

Pre-arrival Instructions

3.5.5. A related issue is provision of pre-arrival instructions. Console operators currently do not provide pre-arrival instructions. With the limited first responder program available through the AAMC, the opportunity for providing pre-arrival instructions is important.

3.5.6. Pre-arrival instruction is a subject under FSD's ongoing consideration. The resource implications in providing pre-arrival instructions have not

yet been determined. It is recommended that, as a trial, FSD introduces pre-arrival instructions for life-threatening cases such as unconscious or cardiac patients where measures taken at the scene might have a real impact on the survival of the patient. (A sample instructions sheet is attached as Attachment 6)

3.5.7. Introducing pre-arrival instructions may require switching the existing operation mode of the FSCC from aggregated call taking/dispatching in which the Console Operator is responsible for both taking the call and dispatching the ambulance resources to separated call taking/dispatching. This issue was considered by FSD in the study leading up to procurement of the TGMS with the conclusion that the aggregated mode was the most suitable for Fire Services for Hong Kong. There are also doubts as to the response of the general public towards the delivery of pre-arrival instructions as it is considered that people in Hong Kong are reluctant to answer questions whilst seeking emergency assistance. It was recognized that public education may address this issue. Nevertheless, TGMS will be capable of assisting in the delivery of pre-arrival instruction by the console operator.

3.5.8. FSD may carry out a further study as to alternative means of delivering pre-arrival instructions and assessment of resources requirement for their implementation.

3.5.9. Specific areas to be considered in this Study might include:

- The Standing Orders for Console Operators in handling call taking/dispatch in association with the TGMS
- The capabilities, capacities and functionality of the recommended Management Information System
- Definition of the algorithm for dispatching ambulance resources that best meets PAS needs.
- Mechanisms for change to the dispatch algorithm.
- The audit process
- Preferred 'triaging' methodology.
- Training of Console Operators.
- The TGMS transition strategy.

3.5.10. It is important that the Ambulance Command becomes more involved in reviewing the contract specifications and the preliminary designs for the TGMS. The Ambulance Command needs to be more involved in the development of, and transition to the TGMS and in developing the MIS it requires.

3.5.11. The call taking protocol, dispatch algorithm, work flows, roles, responsibilities and other requirements and specifications within the FSCC need to be developed to maximise the benefits of TGMS.

3.5.12. The introduction of the TGMS provides a good opportunity to use technological assistance to best utilise the scarce ambulance resources and improve the pre-hospital patient care provided to the community. A properly designed MIS could generate key management reports that add great value in managing the performance of Ambulance Services. This is also critical in the early stages of the current implementation program as the ability to change requirements at a later date will be constrained by contract variations and cost. The Ambulance Command needs to become more involved now.

3.5.13. The Ambulance Command must make clear any design issues relating to TGMS that arise from the very different nature of emergency ambulance response to that of fire services. The complex nature of medical priorities is easily under-estimated.

Radio Network

3.5.14. The radio network must fully support Ambulance Command's communications needs of the ambulance services. The network is currently sufficient for needs however as developments occur in relation to digitalization it is imperative that the radio network incorporates the technology that will enable the collection of all pertinent data i.e. clinical information, mobile data terminal (time stamping) etc. having regard to the constraint of future network data transmission rates and allowable bandwidth frequencies.

3.5.15. It is also imperative that the network should provide SAR wide radio coverage to enable radio contact with crews at all times. This will require planning to respond to any growth the Ambulance Command may undergo.

3.5.16. It is important that the radio network should extend to all A & E Departments with functionality that can effectively facilitate direct bi-directional communication between the ambulance crew and the A & E Department staff for possible patient diversion, preparation of patient reception at hospital and on-line medical advice on request.

3.6. Improvement to Ambulance Service

Depot locations

3.6.1. Effective deployment of ambulances at depots and outstations will ensure the best response in the face of increasing demand. The demand growth is a critical factor for the planning of the ambulance service in the long term. As the two determinants of response time are availability of the ambulance resources and travel time, it will be necessary to frequently

review the location of depots and the daily deployment of the ambulance fleet. Potential locations for new ambulance depots can be explored using the computer planning model described in Attachment 5.

Ambulance Size and Type

3.6.2. Ambulance size and type need to be commensurate with the FSD's needs. Issues of response capability, appropriate work platform for higher levels of treatment regimes and safety of patients, paramedics and the public must also be addressed.

3.6.3. Currently, ambulance size and type is not an issue of high priority. FSD should however be mindful that as the qualification and practices of the paramedics improve, demand for an improved vehicle may follow and issues of safety in vehicle design and appropriate working platform will be the likely determinants of that demand. A vehicle that is cost effective also becomes more desirable as the operational costs of FSD increase over time and the budget is subjected to more intense scrutiny in an effort to reduce cost.

Rostering

3.6.4. Rostering is a critical function as it ensures paramedics are available for duty on an operational ambulance and ensures a service response capability. Incorporated within this function is the need to develop rosters that will:

- match supply and demand,
- determine the optimum staffing levels,
- accommodate sick leave,
- establish long term training requirements,
- roster special duties and short term training,
- ensure the PAS response performance can be met.

3.6.5. The demand pattern shows clearly that Ambulance Command shift configurations do not match demand and alternatives need to be developed. This is a fundamental requirement as 'move up' policies (where ambulances are redeployed to nearby depots or out-stations to meet short term gaps in cover) and extra crews rostered by use of overtime are both short term fixes only and do not address the issue of response capability matching demand. Ambulance Command currently has half as many night shift resources compared to day, yet demand remains relatively high beyond the end of the day shift at 2030 hours through to 2300 hours.

3.6.6. The current day/day/night/off/off rostering does not enable the Ambulance Command much flexibility in addressing the daily demand profile. The

rosters need to particularly address the peak demand with any increase in resources directed at the current overload period 2030hrs to 2300hrs.

3.6.7. As part of long term strategy, the roster configuration will need to be reviewed. As the PAS matures and community and stakeholder expectations increase, Ambulance Command needs to develop roster configurations that meet performance expectations. A spread of rosters is needed aimed at reducing the gap between the availability of ambulances and the demand for their services. However, changing the rostering pattern to provide some additional ambulances for the overload period in lieu of ambulance shifts in the less busy hours should proceed with close consultation and discussions with the Union's Representatives.

3.6.8. Currently, staff shortfalls in operational levels are met by those in place with some managed redeployment within region. Sick leave, annual leave and training rotations create shortfalls in the duty roster. The use of off duty staff to meet shortfalls in operational manning levels is not desirable as a long term solution and adds additional costs. It should be limited to short term application.

Prioritized Dispatch

3.6.9. Developing a priority dispatch capability will take some time. It should involve a structured call taking protocol, a dispatch matrix, FSCC staff education, additional staff within the FSCC, and additional support from the TGMS.

Customer Services and Customer Relations

3.6.10. One area in which FSD is lagging behind ambulance services in other advanced countries is customer services and relations. Ambulance services are constantly in the public eye. It is important that the public understands what paramedics are doing at an emergency scene; both how and why paramedics respond the way they do, also there is a need to help educate the public regarding injuries and illness identification and treatment.

3.7. Human Resource Issues

3.7.1. In developing the strategic plans for Ambulance Services, it is imperative that the Ambulancemen's Union is involved in the development of these strategic plans and that issues important to them are treated and negotiated sensitively at a strategic level with the longer term implications of each initiative being made clear in the wider context. It is important that changes are not negotiated on a transactional basis.

3.7.2. FSD needs to recruit and select new ambulancemen on the basis of criteria that are most relevant to the new PAS. New operational criteria should be made clear through changes in the terms and conditions of employment. This would enable the process of building in long term flexibility for the ambulance services, as the demand profile for Hong Kong is unlikely to reduce. For instance, greater flexibility is needed through different rosters that are able to better match the demand profile.

Recognition of Paramedics

3.7.3. EMA II qualified ambulancemen currently receive a special allowance equivalent to 10% of the GDS(R)1.

3.7.4. This allowance remains as a temporary allowance and its ongoing application is not guaranteed. While it has fulfilled its intended functions, the temporary status of this Allowance raises concerns about its ongoing availability.

3.7.5. In recommending the Allowance, the Standing Committee on Disciplined Services Salaries and Conditions of Service agreed its application to Senior and Principal Ambulancemen and its extension to qualified Ambulancemen has not been considered.

3.7.6. The payment of this allowance to EMA II qualified ambulancemen provides an effective incentive to all those personnel in fulfilling their extra skills and knowledge relating to patient assessment, patient care and reporting of patient history and should be given a permanent status. FSD and its staff will benefit from the flexibility of this allowance approach in resolving issues associated with forfeiture of EMA II duty, failure in recertification and the necessity to extend EMA II training and duties to the rank of Ambulanceman. Likewise, it should be made clear that this allowance is available to all EMA II qualified Ambulancemen and not limited to NCOs. The annual recurrent implications of this allowance once all ambulances are manned by EMA II qualified ambulancemen will be approximately $11.4 Million per year. This amount is the product of about 718 allowance quota, 12 months per year and the monthly extra duty allowance of $1,325 per month

3.7.7. With their higher skills in pre-hospital care, the greater responsibilities they are required to shoulder and the more demanding promotion criteria (if EMA II qualification became a basic requirement for promotion to Senior Ambulanceman), it is quite possible that ambulancemen might pressure the Standing Committee on Disciplined Services Salaries and Conditions of Service for review of the ambulancemen's salary scale. If this request were successful it would give rise to problems of relativity among other disciplinary forces.

3.7.8. If EMA II qualification became a basic requirement for promotion to

Senior Ambulanceman, all ambulancemen should be given equal opportunity to attend the EMA II training. Over 1,000 ambulancemen would be eligible for attending EMA II training. This would not be affordable and would create thorny problems in selecting those who would receive their training ahead of others and therefore have better promotion prospects.

3.7.9. With the need for recertification, the incorporation of EMA II qualification in the promotion criteria is in conflict with the existing civil service system which makes no provision for demotion of a Senior Ambulanceman in the circumstance that he failed his recertification.

3.7.10. On the other hand, if recertification was not a mandatory requirement for EMA II, FSD will :

- be unable to ensure the quality of ambulance personnel who are relatively less self-reliant/assertive and need more guidance in the course of execution of their duties (this can be reflected in the protocol-driven nature of EMA training in which ambulance supervisors can only exercise limited discretion) when compared with other medical profession such as nurses and doctors.

- be relatively inferior to other overseas ambulance services such as USA and Australia in their ensuring their skills are maintained through regular recertification.

- face strong objection from medical professions who believe that recertification is essential for ensuring the skills and competency of the EMA II are maintained.

- most probably, be unable to maintain accreditation from JIBC.

3.7.11. If the ambulance services, like the medical professions, itself has a well-established registration system, it might in the future be possible to replace recertification by other form of education and/or training. This option is unlikely in the near term.

3.7.12. In respect of recertification, some alternative means of encouraging EMA II qualified NCOs to undergo and achieve recertification of their EMA II skills include:

- Demote those NCO's who fail to achieve recertification. (Probably not practicable in the present civil service system and is unlikely to be acceptable to the ambulancemen.)
- Award an insignia for recertification and achievement of different specialist skills and publicize the EMA II's community service.
- Award a lump sum payment to ambulancemen who are successful in recertification as encouragement. (This is practiced by some overseas

ambulance services e.g. Seattle. On the other hand, this is simply a variation on the current system where ambulancemen are rewarded by allowance.)

3.7.13. The form of recognition for EMA II is the determinant in resolving this complex issue. Ambulancemen with EMA II duties could be recognised through continuation of the special allowance or by re-ranking. Re-ranking will potentially result in three new ranks – Principal Ambulancemen, Senior Ambulancemen, Ambulancemen AND Principal Ambulancemen (with EMA II), Senior Ambulancemen (with EMA II), Ambulancemen (with EMA II). Review of ranks in the disciplined services may bring more pressure for consideration of other re-ranking within the Department and across other services. Ambulancemen's Union has already expressed its support for re-ranking but is unlikely to accept demotion for an EMA II qualified NCO that fails his re-certification. Some options (such as inclusion of this element into the salary structure) are analysed below by listing the advantages and disadvantages of three alternative means of recognition.

Advantages	Disadvantages
Allowance	
• Simple and easy to implement and does not have significant financial implications. • It caters flexibly for the voluntary nature of EMA training and the re-certification. • There have never been any insurmountable problems with granting allowances to EMA II supervisors provided the allowance quota was adequate. • While the existing rate of 10% GDS(R) Pt. 1 appears reasonable in recognizing the responsibility, skill, training, and the need for re-certification, the rate could be adjusted when any significant change is introduced. Such flexibility is not available with other opti ons discussed.	• Ambulance personnel prefer other approaches. • It will not bring forth improvement in promotion prospect for Other Ranks.
Reflected in the Basic Salary	
• Involves no additional staff and training. • It provides due recognition and incentive for existing EMA II supervisors.	• There will be need to be six salary scales for ambulancemen. • Demarcation of the new salary scales will be extremely difficult. • Problems associated with failure in re-certification.

Advantages	Disadvantages
	● Pay parity among disciplined services will be upset. ● Financial implications will be considerable. It cannot flexibly cater for any future changes in scope of EMA II skills once the salary scales are demarcated.
Re-ranking to Principal Ambulanceman	
● Better promotion prospects and fringe benefits associated with the higher rank would give due recognition and incentive to Senior Ambulancemen. ● Creation of better promotion prospects for Other Ranks i.e. Ambulancemen will be promoted to Principal Ambulancemen direct, serving as a motivator for advancement. ● Involves no additional staff and training.	● No incentive for existing Principal Ambulancemen with no increase in income or fringe benefits. If an additional increment was introduced or a new rank created, the pay parity among disciplined services will be upset. ● Management problems associated with delegated authority, distribution of work and chain of command, e.g. one Principal Ambulancemen in the watch responsible for managing the watch of ambulance crews while the other only responsible for manning an EMA II ambulance. ● Problems associated with failure in re-certification. Extra effort such as periodic refresher training to EMA II to minimize the risk of failure. Remedial courses will be required for failed EMA II with burden borne by FSD in the long term. In the event that an EMA II could not pass re-certification, FSD would face with placement problems. ● All NCOs will become Principal Ambulancemen i.e. permanent deletion of the rank Senior Ambulanceman. ● Would create a new promotion channel to Principal Ambulancemen in parallel with existing common channel through staff performance appraisal. This would raise problems with staff e.g. poor morale among non-EMA II Senior Ambulancemen. ● Financial implications would be considerable because it involves promotion of all Senior Ambulancemen to Principal Ambulancemen.

Occupational Health and Safety

3.7.14. Ambulancemen are working in a particularly hazardous environment. This arises from a different circumstance peculiar to ambulance services. Particular concerns are: exposure to patients with infectious diseases

such as HIV (Human Immunodeficiency Virus) and HBV (Hepatitis B Virus); heavy lifting; and dangers arising from the emergency and possibly high speed transport of patients in a life threatening condition.

3.7.15. Historically, ambulancemen have been prone to chronic back ailments arising from the need to frequently lift patients and the stretchers in confined and poorly accessible spaces that limit access and maneuvering. This often, eventually takes its toll with the older ambulancemen who are less physically fit and who have been exposed to this circumstance over many years. Once back strain arises it frequently becomes chronic and very painful.

3.7.16. In respect of increased risk of traffic accidents, FSD has an excellent record and this is a reflection on effective training and management of this risk.

3.7.17. Exposure to infectious diseases has become more of a concern in recent years. Ambulancemen may have to deal with patients suffering from infectious diseases. They are also exposed to and have to deal with patients in trauma situations where there is open wounds and blood – in which an infection will not be obvious.

3.7.18. FSD has introduced occupational health/safety concepts and measures to its ambulancemen through initial training and Standing Instructions respectively. But FSD and its staff will further be advantaged by establishing a comprehensive Heath and Safety Plan that will be regularly maintained and developed.

4. SHORTER TERM MEASURES FOR AN IMPROVED PAS

4.1. More Resources to Meet Surging Demand

4.1.1. With surging growth in calls, there is an increasing shortfall in ambulance crews. As discussed in Section 3.1 and in Attachment 4 of this Report, the current shortfall is estimated at 19 ambulances in 2001 increasing to 39 ambulances by 2003 (with the ambulance availability of 212 in 2001). Government needs to commit now to providing these additional resources. This does not include the additional recruitment needed for other initiatives discussed elsewhere in this report.

4.1.2. Each year Government conducts its Resource Allocation Exercises in respect of both capital and recurrent expenditure. Bureaus and departments compete for the available resources with prioritization determined by Star Chambers. In allocating funds, Star Chambers is mindful of the communities concerns. This study has shown that the current ambulance resources are too heavily utilized with performance already deteriorating particularly over the period 20:30 through to 23:00.

4.1.3. Assuming that additional resources are made available as part of the Administration's 2001 RAE, FSD will be authorised to train the new staff commencing in April 2002. FSD has committed the substantial training facilities available at the FSTS at Pat Heung which has the capacity to meet this substantial increase in recruitment training from April 2002. Allowing for the 24-week training program, the earliest time the new recruits will be available for operational duty is October, 2002.

4.2. Transition to Full PAS

4.2.1. FSD is committed to accelerating the full provision of PAS. At April 2002, there will be more than 500 existing ambulance supervisors yet to be EMA II qualified. The availability of trainees, trainers and the training facilities will determine how long this program will take.

4.2.2. The Ambulancemen grade is heavily committed in providing ambulance services to the public. With the surging demand in ambulance calls and limited increase in the overall establishment, many ambulance depots are very busy responding to calls. Any reduction in the number of ambulances in the field will increase utilization, further reducing efficiencies and achievement of the response time performance targets.

4.2.3. At this accelerated level of paramedic training and without additional resources, there will be a reduction in operational manpower resources of the ambulance fleet of around 8 ambulance shifts every day, as at any one time there will be a need to release 40 ambulancemen and 10 officers

away from active duty. This is at time when operational manpower resources are already below operational needs.

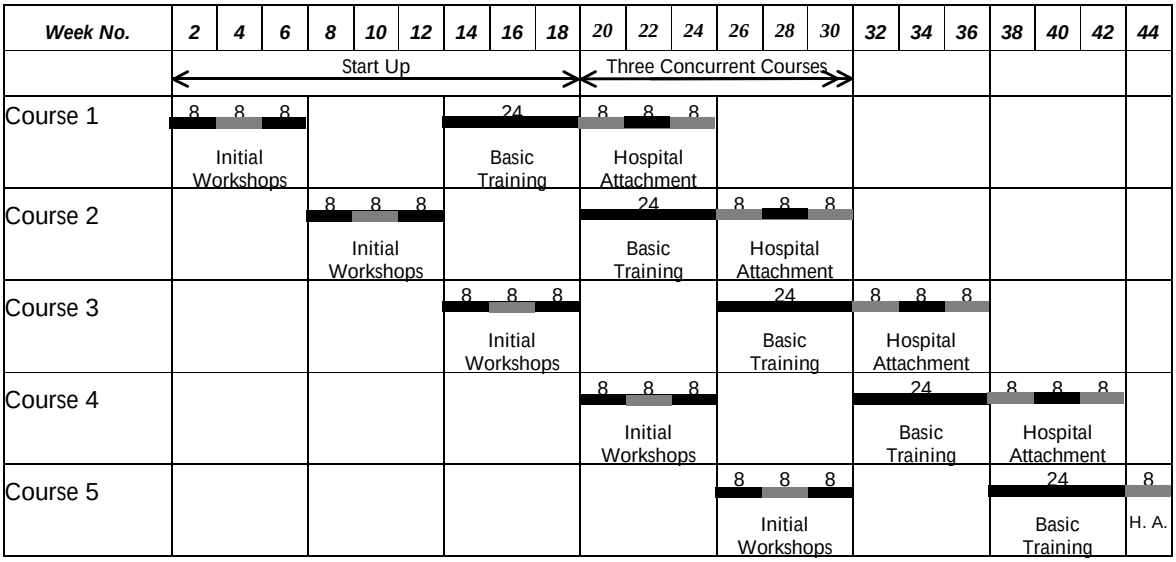

Figure 4.1 Bar Chart showing first 44 weeks of the accelerated EMA II Training Program with the overlap of three courses. Number of Trainees is indicated on each bar.

4.2.4. It is recommended that this shortfall must be met through advanced recruitment of 40 ambulancemen and 10 officers. If these resources were available the overall impact on operations would be neutralised. Once the Government has committed the needed resources, training for the advanced recruits can be completed within six months. As a short term measure, in order to fill in for the 50 posts, it is recommended that acting appointment and recalling of off-duty ambulancemen be arranged to provide the needed cover. From FSD's experience, this level of backup will be viable and sustainable over the six months needed to provide these resources through advanced recruitment.

4.2.5. The availability of training facilities is also a significant constraint. The FSACTS at Ma On Shan provides all Ambulance Command training including both initial recruit training and paramedic training. With the need to accelerate both these programs, the FSACTS currently has the capacity to qualify 48 ambulance supervisors to EMA II and to provide initial training for 192 recruits. By transferring the initial training to the FSTS at Pat Heung (with its much larger training capacity), the capacity of FSACTS can be upgraded to train around 192 paramedics per year.

4.2.6. This accelerated EMA II program can be maintained until FSD are confident that every operational ambulance can be manned by a paramedic. It is recognised that some of the Supervisors may not wish to sit in on, or may not be successful in passing, the EMA II program. All these supervisors will, however, have received EMA I level paramedic training, by early 2005. During the EMA I training, the training officers

will determine whether the Supervisors have the potential to complete the EMA II training, and will encourage the appropriate Supervisors to continue with additional tutorial support to complete the EMA II training. Beyond early 2005, those ambulance supervisors who are qualified of EMA I level will be assisted by an EMA II qualified Ambulanceman. In these cases, while the Supervisor will have the much clinical knowledge needed, he will only sometimes rely on the EMA II qualified Ambulanceman in his crew to perform some of the specific protocols. To further reduce the clinical gap between the EMA I Supervisor and his EMA II qualified attendant, FSD may also consider introducing some less skill demanding protocols (such as nebulized salbutamol and nitroglycerine spray) to enable the EMA I Supervisors to carry out the necessary procedures.

4.2.7. It is currently anticipated that around 250 Ambulancemen (below NCO level) will also be trained to EMA II level. Priority should be given to those ambulancemen who possess the promotion qualification, appropriate academic background (Secondary Five) and at least 10 years ambulance work experience. Once the accelerated EMA II training program is completed, it is recommended that the EMA II training program be maintained at a level to meet expected natural wastage. Initially this will be around 60 to 80 per year, but will increase year-on-year to an expected 100 to 120 per year by 2010. This approach will ensure that FSD can man all ambulances at EMA II level.

4.2.8. In summary, provided the necessary financial resources are allocated, FSD can meet the training needs of an accelerated EMA II training program. This will involve relocating (on a temporary basis), initial recruit training to Pat Heung and some temporary alterations and additions to the FSACTS at Ma On Shan. The current program of training 48 EMA II paramedics will be accelerated to train a total of 192 paramedics each year. Further acceleration of this program would prejudice the delivery of emergency ambulance services given the current shortfall when compared with the surging demand of ambulance services in Hong Kong.

4.3. Quality Assurance

4.3.1. With the transition to full PAS, the Ambulance Command will no longer be viewed as the “ambulance service” and the personnel assigned to staff the ambulances will be seen as health care professionals (physicians and nurses in the A & E departments).

4.3.2. The addition of advanced level practice and skills will cast the Ambulance Command in a different light, with the men and women of the Ambulance Command seen as health care professionals. It is important that sufficient clinical supervision and quality assurance mechanisms are in place. Providing paramedic ambulance service within an organization

of the size of the Ambulance Command is both complex and challenging.

4.3.3. The Medical Director supported by a dedicated Quality Assurance Team will oversee FSD's provision of clinical services.

4.3.4. The success of a Quality Assurance Program demands a plan which is dynamic and organization wide in nature that has total organization commitment. It is an ongoing, comprehensive process, with regular evaluation of the effectiveness of patient care and staff development.

4.3.5. There has been some quality assurance initiatives undertaken and some processes documented in a very positive way as described in Section 2.7. However these initiatives do not yet represent a truly organizational wide Quality Assurance Program.

Quality Assurance Objectives

4.3.6. It is important that FSD develop a coordinated Clinical Quality Assurance Program across the organisation, which will meet quality assurance objectives by:

a) Establishing the clinical performance standards for all operational paramedics;
b) Providing education to meet the set clinical performance standards;
c) Empowering paramedics through education to take responsibility for their own clinical and professional performance;
d) Providing educational and technical support to QA managers to enable them develop the evaluation and assessment skills required for development of the professional practice within their teams;
e) Evaluating the clinical performance of the service and the individual paramedics to ensure that the current clinical standards are met;
f) Monitoring the standards of clinical performance to ensure that they meet service objectives, and are in line with key performance indicators;
g) Adjusting clinical standards of the service based on evidence provided through evidence based practices;
h) Providing a conduit for two-way communication to all levels of the organization on clinical performance based on evidence gathered through assessment and evaluation.

4.3.7. An appropriate Quality Assurance Program will in its very nature improve the skills and practices of the PAS, the care the patients receive and the responsiveness of the system to the real demands of Hong Kong.

Clinical Services

4.3.8. The Medical Director has a major role in the development and delivery of the EMA II programs and develops protocols for clinical care, triage and

audit for these EMA II program.

4.3.9. The Medical Director is the current chair of the Hospital Authority's Sub-Committee on Pre-Hospital Care. This committee does not have a structural relationship with the Ambulance Services. It is advisable to formalize this relationship in the future. Other functions of the Medical Director include:

- Conducting re-certification and continuing medical education for the EMA II qualified personnel.
- Providing clinical and medical advice to FSD in relation to mass casualty and clinical management and care.
- Maintaining medical supervision of FSD and ensuring communications with the HA and hospital medical staff.

4.3.10. With the Medical Director's involvement in both the EMA II training and the related quality assurance activities, the demands on the Medical Director will increase substantially. Both of these programs shall be enhanced under his guidance and will then require more of his input. The current half time arrangement is inadequate. In the short term the sessions should at least be equivalent to two half time positions, increasing by April 2003 to the equivalent of three half time positions.

4.3.11. From January 2002, full provision of PAS will enter its preparatory stage and the Medical Director should start to be supported by an additional Associate Medical Director. The Medical Director will develop long range and strategic plans for clinical field operations to include new advances in pre-hospital care, new equipment, etc. He will develop and review treatment protocols. He will function as the lead clinical manager in any interaction with the HA. He will work with the Ambulance Command to identify new and emerging needs and develop responses to meet these needs.

4.3.12. The first Associate Medical Director will provide support to the FSACTS. This person when necessary will deliver lectures for the initial training program, the EMA II program, CME programs, refresher programs and any other program that may be needed at the FSACTS. The Associate Medical Director will work on curriculum development and identify training needs of the Ambulance Services. He will also work with Ambulance Service staff who have been referred back to the FSACTS for remedial training. He will develop clinical training objectives for the staff. He will develop programs for delivery as needs are identified and assessed. He will also plan a yearly training calendar as well as a 5-year strategic plan for training and education.

4.3.13. The Medical Director with some input from the Associate Medical Director will work with the Quality Assurance Team to further develop

the Quality Assurance system. This will include coordinating the roll-out of a more substantial field audit scheme conducted by the designated Ambulance Officers and input into the new Clinical Management Information System which is recommended to be developed in parallel with the TGMS.

4.3.14. From April 2003 when over half of the ambulances in the EC fleet are paramedic, the Medical Director will need to be supported by two Associate Medical Directors. The first Associate Medical Director will continue to provide support to the FSACTS. The second Associate Medical Director will focus on the Quality Assurance initiatives and develop measures of performance, investigate and report on issues related to customer care and will continuously evaluate performance and analyze the system for areas of improvement. He will work with the Quality Assurance Team to develop benchmarks for performance, as well as key performance indicators. They will post results of quality improvement initiatives which are designed to identify areas of improvement. They will prepare and deliver training programs on quality assurance to all levels of the Ambulance Service and will identify staff who require remedial training and refer them to the FSACTS. The second Associate Medical Director will develop a yearly plan with goals and objectives for the Quality Assurance Program as well as a 5-year strategic plan for quality assurance.

4.3.15. In view of the scope and nature of the clinical services required, it is recommended that Medical Director and his associates be recruited from Hospital Authority. This approach will not only ensure candidates will have good knowledge and experience in emergency medical services but also enhance the continuity of care from pre-hospital to hospital for the patients.

Clinical Management Committee

4.3.16. To enable all of the above to occur and develop further in the future, the PAS needs to have a clinical reporting structure. This should consist of a Clinical Management Committee chaired by the Senior Assistant Chief Ambulance Officer who reports to the Chief Ambulance Officer. This composition of the Clinical Management Committee will reflect the main function of this committee which is to ensure the effective performance of the PAS in respect of the clinical aspects of the paramedics' services.

4.3.17. The involvement of the Medical Director is critical as his judgment in respect of the clinical performance of the paramedics and the PAS is a key benchmark. In ensuring the overall performance of the PAS, this structure will enable independent clinical assessment is addressed by line management. FSD can focus confidently on addressing the needs of its major stakeholders including the general public in regard to clinical standards and performance.

4.3.18. Specific issues for the Clinical Management Committee to consider would be:

- Clinical performance of the service.
- Performance and governance of the training center.
- Paramedic curriculum and qualification level.
- Recognition of prior learning of paramedics for qualification.
- Specialist training requirements.
- Remedial training packages.
- Medical equipment to support the paramedic service delivery

4.3.19. The members of the Clinical Management Committee might usefully compose the following:

- Senior Assistant Chief Ambulance Officer
- Superintendent/ Quality Assurance
- Deputy Commandant/ FSACTS
- Medical Director
- One other HA Representative of the HA's Sub-Committee on Pre-Hospital Care
- Specialists other than emergency physicians (eg Cardiologist, Paediatricians and Anaesthetists) can be asked to provide input as and when necessary and need not be regular members of the Committee

Dedicated Quality Assurance Team

4.3.20. The Quality Assurance function requires a dedicated full time team led by an officer-in-charge and supported by other personnel both full time and part time to perform all the necessary functions of quality assurance. This function is especially important as the Ambulance Command upgrades the skills to paramedic level on an accelerated program. It is currently envisaged that the QA team should be led by an officer of Superintendent rank, assisted by two officers of Senior Ambulance Officer rank.

4.3.21. To be fully effective, data collection and analysis should occur in real time mode. Given the need to record and analyse a substantial amount of operational and clinical data, electronic means shall be needed to capture relevant raw data and ensure the quality assurance function is effective. Electronic data collection will lead to the ability to develop realistic, system specific benchmarks. Working with the planning section, key performance indicators could be identified and goals could then be outlined with realistic timelines for implementation and achievement.

4.3.22. The quality assurance team would also be responsible for training of personnel at all levels in respect of the quality assurance process as well as designing and overseeing the quality improvement plans.

4.3.23. While the number of EMA calls is increasing on a year-by-year basis, the number of QA man-hours will increase directly in line with the number of paramedics. The size and make up of the QA Team is yet to be determined but must be adequate to effectively carry out all the QA activities in respect of all qualified paramedics.

4.3.24. With the development of the Quality Assurance system, a clinical support function will be established utilising the EMA II trained Ambulance Officers as QA Auditors. This will not only greatly assist in the skills development of the paramedics and maintenance of clinical standards but also strategically maximize the existing officer's strength to meet the imminent and great need for QA Auditors. This approach will gain financial advantages over the utilization of external QA resources.

4.3.25. A profiling approach shall be adopted for all paramedics with a target ratio of paramedics to QA Auditor not greater than 16 to one to ensure continuity in the quality assurance process. Field audits shall be provided by the Ambulance Officers trained as QA Auditors. It is envisaged that this team will comprise one operational Ambulance Officer from each depot and all the duty Ambulance Officers from each region.

4.3.26. The QA activities shall focus on the paramedics and their care for the patients. The QA program shall involve:

- In the field (at scene) supervision
- Peer review of crew reports
- (Possibly in future) patient outcome studies
- Feedback sessions to paramedics
- Preparing QA reports
- Conducting meetings to determine whether protocols are being followed, and if not, the means of addressing this issue and completing the audit cycle.

4.3.27. Profiling will require logging of all cases processed by paramedics, initially by hard copy and filing, and in future by electronic data entry.

4.3.28. QA Auditors shall collect sample and analyze each paramedic's log every 3-months. The analysis shall focus on whether there was proper selection of protocol when required. Analysis shall extend to include samples of non-EMA cases (say 10%) to screen for failure to activate the needed protocol. The analysis shall also focus on implementation of protocols while also checking for frequent and infrequent use of protocols and skills. The QA Auditors should provide feedback in respect of well-performed areas and coaching and supervision for poorly performed or infrequently performed protocols.

4.3.29. QA Auditors shall also conduct in-the-field assessments by accompanying paramedics for at least 1/2 day while they are treating patients. Frequency is expected to be approximately one session/paramedic/3 months (quarterly).

4.3.30. The QA Auditors shall conduct feedback sessions to the assigned paramedics. These sessions shall be conducted in small groups of 2 to 4 so that paramedics can learn from each other. The group size should not be extended beyond 6 as this will impair the opportunity and atmosphere for discussion.

4.3.31. These feedback sessions shall be conducted quarterly with each paramedics presenting two cases that the paramedic has conducted since the last feedback session - one best done and one worst done case. Paramedics are expected to research literature for information related to the cases to enrich the discussion. QA Auditors will facilitate the discussion and give comments.

4.3.32. Reports of profile analysis, the field assessment, and supervision / coaching conducted for each individual paramedics shall be submitted and filed by every QA Auditor on a 3-monthly basis (quarterly) to the FSACTS. This will provide a comprehensive record and measure of the performance of the PAS.

4.3.33. In view of the administrative work involved, the QA Team needs two dedicated clerical staff to support the QA function. Tasks will include data entry, data processing, filing, report generation as well as data analysis for QA Auditors prior to their supervision sessions, keeping logs of the EMA II qualified and current certified paramedics, ensuring recertification for paramedics within the required time frame. These clerical staff will also ensure that all reports are handed in promptly. This will ensure effective centralization of all data and ensure the overall integrity of the QA system.

4.4. Ambulance Command Training School (FSACTS)

4.4.1. The FSACTS was developed some 11 years ago and was designed to cope only with the level of demand at that time. With the needed increase in EMA II training, the FSACTS does not have sufficient capacity.

4.4.2. The requirements in respect of training in the Ambulance Command have increased and will continue to increase not only in terms of volume but also in terms of quality. As FSD expect improved performance of its EMA II's, the FSACTS will be expected to provide enhanced training. For example scenario based training is the norm in many developed ambulance services as it is in HK. The FSACTS currently uses innovative ways to provide this type of training for EMA II's, however, as the

standards improve this requirement will grow and the FSACTS will be under pressure to meet this demand.

4.4.3. FSACTS needs additional classrooms, simulation rooms and associated office space to be built now to cope with recruit training, the ongoing provision of EMA II qualified paramedics as well as the maintenance of their skills.

4.4.4 In order that extent of the new facilities can be determined, a comprehensive training schedule has been developed. In this way, a draft schedule of accommodation has been developed (see Attachment 7).

4.4.5. Table 4.2 shows a comprehensive summary of the paramedic training courses that will be undertaken at FSACTS. There is some paramedic training that will be undertaken away from the FSACTS such as the two-week clinical practice that each EMA II Trainee undertakes at Government hospitals.

4.4.6. This summary of the needed long term paramedic training shows that this training load is ongoing and will require the long term commitment of the dedicated training team comprising the SAO and 9 AO as trainers, as well as the continued retention of the additional 40 Ambulancemen to enable the release of trainees beyond the full provision of PAS.

Major Paramedic Training Course	Class size		Year				
			2002	2004	2006	2008	2010
Phase 1 - Upgrading of Skills Level							
2-week EMA II Workshop	8	Man-week	384	384			
		Courses	**24**	**24**			
6-week EMA II Course	24	Man-week	1152	1152			
		Courses	**8**	**8**			
2-week Hospital Attachment	8	Man-week	384	384			
		Courses	**24**	**24**			
Phase 2 - Maintenance of Skills Level							
2-week EMA II Workshop	8	Man-week			144	144	144
		Courses			**9**	**9**	**9**
6-week EMA II Course	24	Man-week			432	432	432
		Courses			**3**	**3**	**3**
2-week Hospital Attachment	8	Man-week			144	144	144
		Courses			**9**	**9**	**9**
2-week EMA II Re-certification (every 3 years for each EMA II)	12	Man-week	216	216	600	600	600
		Courses	**9**	**9**	**25**	**25**	**25**
2-week EMA I program (for ambulance aid personnel)	12	Man-week	240	240	240	0	0
		Courses	**10**	**10**	**10**	**0**	**0**
2-day EMA I update course (every year for each EMA I)	12	Man-week	0	0	0	523	523
		Courses	**0**	**0**	**0**	**109**	**109**
Continuing Medical Education (4 days every 3 years for each EMA II)	24	Man-week	90	192	243	243	243
		Courses	**14**	**30**	**38**	**38**	**38**

Major Paramedic Training Course	Class size		Year				
			2002	2004	2006	2008	2010
3-day Advanced Airway Management course	12	Man-week	50	50	115	43	43
		Courses	**7**	**7**	**16**	**6**	**6**
4-day Advanced Airway Management Reassessment	12	Man-week	67	202	422	730	730
		Courses	**7**	**21**	**44**	**76**	**76**
Training commitment	**-**	**Man-week**	**2583**	**2820**	**2341**	**2859**	**2859**
No. of courses to be held	**-**	**Courses**	**103**	**133**	**154**	**275**	**275**

Table 4.2 Summary of Major Paramedic Training Programs (Details of full projected figures and calculations are contained in Attachment 8)

4.4.7. Each of these courses will be rostered to ensure effective utilization of both trainees and the training facilities.

4.4.8. EMA II Recertification Programs will be intensified after the full provision of PAS and will provide a review of the original training program within a condensed period (2 weeks every 3 years). This is a serious issue for FSD. As the recertification programs are ideal for revision and remediation, recertification programs are not intended to deliver relevant contemporary information to the paramedics who are currently active in the field. It is however recommended to incorporate some additional training to further advance the cognitive and psychomotor skills of the paramedics. By improving the methods of reassessing competencies, follow-up training could be targeted on any skill deficiency. Clinical evaluations, lectures, peer/medical case review, might also be usefully introduced. In fact, while additional protocols and skills are being introduced, the duration of EMA II training and recertification may need to be extended in the future to cover these new elements.

4.4.9. The EMA I Program provides an effective means of upgrading potentially non-trainable supervisors (who may not wish to sit in on, or may not be successful in passing, the EMA II program) above the ambulance aid level. Since supervisors without EMA II qualification will need to be assisted by an EMA II qualified attendant after the full provision of PAS, this approach will help to reduce the gap between their clinical capability and hence alleviate the associated management problems. The EMA I program will also upgrade the clinical level of all ambulance aid personnel. By 2006, all ambulance personnel will be qualified to at least the EMA I level.

4.4.10. EMA II qualified staff also receive an additional 2 days per year of Continuing Medical Education (CME). This CME training should be continued after full provision of PAS but will increase the training workload. Once the full provision of the PAS is achieved, FSD should consider adopting a more comprehensive program. Attachment 9 provides some suggestions as to how the current program structure might be enhanced.

4.4.11. Table 4.3 shows the major Non-Paramedic Training Courses to be conducted at FSTS (2002-2004) and FSACTS (2005 onwards). This summary of the needed long term non-paramedic training shows that this training load is also ongoing and will require the long term commitment of the current FSACTS training establishment.

Major Non-Paramedic Training Course	Class size		Year				
			2002	2004	2006	2008	2010
½-day AED Recertification	12	Man-week	888	888	888	0	0
		Courses	**37**	**37**	**37**	**0**	**0**
24-week Recruit Ambulanceman Training	24	Man-week	2304	2304	2304	2304	2304
		Courses	**4**	**4**	**4**	**4**	**4**
26-week Recruit AO Training	10	Man-week	520	0	260	260	260
		Courses	**2**	**0**	**1**	**1**	**1**
2-week NCO Command Course	15	Man-week	0	0	150	150	150
		Courses	**0**	**0**	**5**	**5**	**5**
2-day Refresher Course (for ambulance aid personnel)	12	Man-week	347	98	0	0	0
		Courses	**72**	**20**	**0**	**0**	**0**
2-week Ambulance Aid Refresher Course	16	Man-week	Converted to 2-week EMA I Course in 2002				
		Courses					
4-week Instructor Course	15	Man-week	60	0	60	0	60
		Courses	**1**	**0**	**1**	**0**	**1**
Training commitment	**-**	**Man-week**	**4119**	**3290**	**3662**	**2714**	**2774**
No. of courses to be held	**-**	**Courses**	**116**	**61**	**48**	**10**	**11**

Table 4.3 Summary of Major Non-Paramedic Training Programs (Details of full projected figures and calculations are contained in Attachment 8)

4.4.12. Currently those recruited as ambulancemen receive 24 weeks of training, during which they receive the EMA I skill and knowledge. This ambulancemen's initial training course and also the EMA I Program mentioned in Section 4.4.9 should be enhanced to include some basic protocols that address Hong Kong patient's needs.

4.4.13. For instance, as most outlying islands are currently lacking EMA II provision, ambulance supervisors assigned to these units, before they are upgraded to EMA II should learn to apply some less skill demanding protocols such as nebulized salbutamol and nitroglycerine spray. This should initially be focused on those assigned to outlying islands with subsequent roll-out to all EMA I supervisors. This issue was discussed by HA's Pre-Hospital Care Subcommittee and has their support.

4.4.14. It is also recommended that EMA I trained ambulancemen receive an annual EMA I Training Update. This will be of 2 days duration. This additional training program should be initiated once all ambulancemen have completed the EMA I Training Program by 2006.

4.4.15. The Ambulance Command is committed to providing a high level of care

to the patients in Hong Kong. Upgrading the initial training level and maintaining these skills will enhance patient care.

4.4.16. Given the increasing demands placed on the FSACTS, it is recommended that in the short term, pending completion of the extension of the FSACTS at Ma On Shan, the non-clinical initial recruit training should be undertaken at the FSTS at Pat Heung. This needs to be in place no later than April 2002 when the frequency of paramedic training is accelerated.

4.4.17. With the initial recruit training moved from Ma On Shan to Pat Heung, the FSACTS can be modified to temporarily provide the necessary classrooms and simulation rooms needed to run the accelerated EMA II program. The cost of the necessary modification work is estimated to be about HK$1Million.

4.4.18. It is recommended that all the additional training facilities required including classrooms, simulation rooms and supporting offices be provided through the extension of the existing FSACTS at Ma On Shan. Table 4.4 summarises the space requirements. Details of the extension and space requirements calculation are attached to this report. (See Attachments 7 and 8.) It is expected that this expanded facility will be in place by late 2004 to early 2005 and will provide sufficient space to satisfy the overall training program through to 2010.

Year	2002	2004	2006	2008	2010
Paramedic Training					
Annual Training Commitment (man-week)	2583	2820	2341	2859	2859
Classrooms	3	3	3	3	3
Simulation Rooms	13	13	13	13	13
Non-Paramedic Training					
Annual Training Commitment	4119	3290	3662	2714	2774
Classrooms	4	3	4	3	3
Simulation Rooms	8	6	8	6	6
Summary					
Classrooms	**7**	**6**	**7**	**6**	**6**
Simulation Rooms	**21**	**19**	**21**	**19**	**19**

Table 4.4 Summary of Training Facilities Needs

4.5. Mobilisation

4.5.1. Calls to the FSCC are varied. Requests can range from someone who has a broken limb, to life threatening situations such as someone suffering from a cardiac arrest.

4.5.2. Currently, console operators do not prioritize the ambulance calls. The consequence is that an ambulance might be committed to a less serious circumstance and become unavailable to a more life threatening

illness/injury.

4.5.3. During periods of high demand, a structured call taking process will ensure priority is given to a patient with a serious emergency.

4.5.4. Sorting (or triaging) ambulance calls as to their level of importance will increase the effectiveness of the Ambulance Services. International best practice is for ambulance calls to be sorted.

4.5.5. In the longer term, triaging of telephone requests into three categories, at a minimum two categories, is recommended because it enables the console operator to identify a life-threatening emergency in which time is of the essence. Initially, triaging should be focused on the unconscious or cardiac arrest patient.

4.5.6. Ambulance services start their care of the caller the moment the phone is answered. This is best achieved by a structured call taking process which will allow the console operator to consistently identify the patients' major presenting problems and to quickly identify life-threatening conditions.

4.5.7. Structured call-taking enables quality improvement activities to include the call information and may enable the Ambulance Command to get a better understanding of the actual demand determinants.

4.5.8. Along with structured call-taking is the need to prioritize dispatch to enable the most appropriate allocation of resources.

4.5.9. Sorting of calls using a structured call taking process will ensure that patients with life threatening problems get assistance as quickly as possible.

4.5.10. With each incoming call the console operator adopts the defined protocol. Then, by way of example, if in requesting information relating to patient's condition, age, conscious state and breathing, the console operator receives information that the patient is unconscious and not breathing (for any reason), before continuing with any further interrogation or instructions, a maximum response will be sent immediately and the caller will be told to stay on the line for further instructions.

4.5.11. Should the console operator learns that the patient is breathing, approximately 30 seconds of additional interrogation will be required to complete the key questions of the structured call taking process.

4.5.12. Alternatively, the console operator will next match the symptoms discovered through the interrogation and send the appropriate response as indicated in the dispatch rules designated by the FSD. After the ambulance has been dispatched the console operator will remain on the

phone with the caller to give appropriate instructions. These instructions are taken from a pre-determined script (see sample in Attachment 6).

4.5.13. Implementation of structured call-taking and priority dispatch capability specifically aimed at the unconscious or cardiac patient will be a significant system improvement for FSD. The benefits of this for the ambulance services will be:

- Better system information.
- Increased understanding of demand.
- Ability to prioritise dispatch with decreased risks.
- Consistent identification of patients' presenting problems.
- Instigate early intervention through the use of pre-arrival instructions (e.g. chain of survival concept in respect of CPR instructions)

4.6. Operations

4.6.1. All ambulancemen are assigned to an ambulance work two 12-hour day shifts and then one 12-hour night shift. They currently change shift at 8:30am and 8:30pm respectively.

4.6.2. Call volumes pick up from 5:30am, peaking at around 9:00am to 9:30am, and maintaining a fairly consistent level to around 5:30pm. The number of calls then steadily drops off through to 5:30am the next day. The early evening suffers the traffic congestion from the evening traffic peak and then loss of 50% of resources at 8:30 pm when calls are still at 90% of the day time levels.

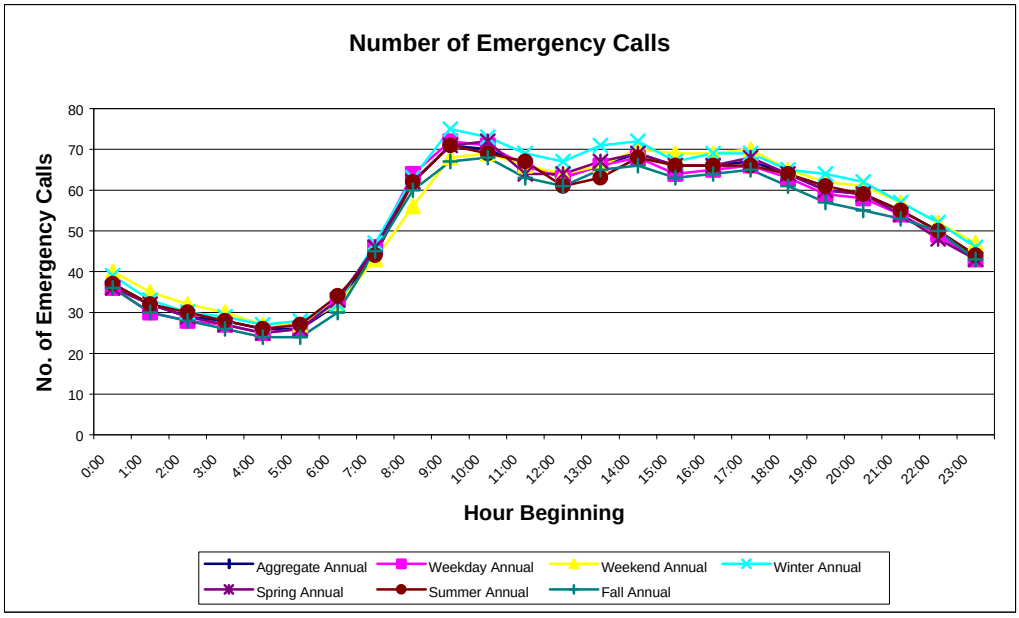

Figure 4.5 Emergency Calls on an Hourly Basis

4.6.3. In addition, the AAMC only works during the day time hours and are not available at night.

Staggered Shifts

4.6.4. Extending the overall duration of the day time shift (now 12 hours) over a longer period through a staggered day shift arrangement will provide more ambulance resources in the evening through to the end of the staggered day shift. It is recommended that the day shift is brought forward to 7:30am with the staggered day shift commencing as late as 12:00 noon and extending through to 12:00 midnight.

4.6.5. Staggering the shift in this way will improve response time by increasing the number of ambulancemen available in the very beginning of the evening.

4.6.6. This staggered shift will be most applicable to all those ambulance depots or out-stations with deployments of 4, 6 and 8 ambulances on day shift. With stations with deployments of only 2 ambulances on day shift, this roster would not be able to respond to the early morning build up in calls.

	Start	End	Start	End
Current Shift	Day Shift		Night Shift	
	8:30 AM	8:30 PM	8:30 PM	8:30 AM
Change to Proposed	Day Shift		Night Shift	
	7:30 AM	7:30 PM	7:30 PM	7:30 AM
	12:00 PM	12:00 AM		

Table 4.6 Staggered Shift Pattern

4.6.7. A number of alternative options were investigated and it is proposed that a trial of the staggered shift arrangement be initiated at the ambulance deployment points where the call volume in the morning and early evening would indicate this arrangement is beneficial, such as: Aberdeen, Castle Peak Bay, Chai Wan, Ma Tau Chung, Sai Wan Ho, Tai Po, Ho Man Tin, Pok Fu Lam, Ngau Tau Kok, Tsuen Wan and Yau Ma Tei.

4.6.8. It is recognized that with fewer ambulances committed at the outset of the day shift, that these ambulances will be more busy. On the other hand the availability of the extra shift through to midnight will spread the calls over more ambulances at the start of the night shift. This will translate into a less stressful situation for the ambulancemen over this period and should reduce the number of move-ups.

Urgent Care Fleet

4.6.9. Urgent Calls account for approximately 12% of the call volume. This service is provided by the Ambulance Command to the Hospital Authority. The establishment of an Urgent Care (UC) fleet within the Ambulance Command will provide an efficient means of dealing with these transfers.

4.6.10. Analysis of Urgent Call data shows that particular Hospitals generate the majority of the transfers. This UC fleet needs only be deployed on a Monday to Saturday schedule. The hours each day can be restricted from 9:00am to 5:30pm, weekdays with a half day each Saturday. With these hours of working, only one shift would be required as a floating reserve to cater for annual leave, sick leave, training, etc. With transfers from smaller clinics being infrequent, the "UC" fleet would be backed up by the "EC" fleet on an as needed basis – particularly covering those periods during which the "UC" fleet is standing-down.

4.6.11. Proper coordination and scheduling through the FSCC will improve performance of the urgent care fleet by scheduling further pickups to coincide with ambulance arrivals at particular hospitals.

4.6.12. Decisions regarding the deployment of ambulances for this fleet will need to be closely coordinated with the Hospital Authority. A trial scheme will be required to determine a cost-effective UC fleet which can handle most of the UC calls without compromising its benefits.

4.6.13. The introduction of the UC fleet might result in some reduction in Unit Hour Utilisation in the day shifts, through an overall gain in efficiency. It is considered that these ambulances need not be manned by EMA II trained supervisors as they would not have the opportunity of applying many of the EMA II skills. These UC fleet ambulances could be manned or supervised by those supervisors who either have not taken the EMA II training or were not successful in completing it provided that the ambulance crew have undertaken special training in respect of inter-hospital patient transfers. The crew must be familiar with patient vital sign monitoring and handling of basic medical equipment/ device accompanying patients including e.g. IV fluids, oxygen delivery systems, various catheters, drains.

4.6.14. The management of the UC Fleet will place some burden on the dispatching or mobilising function of the FSCC. This can be properly addressed by the design and operations of the TGMS. It may be necessary, therefore, to delay the introduction of the UC Fleet to coincide with the provision of a full PAS capability and the commissioning of the TGMS.

More Flexibility in Day/Night Configurations

4.6.15. While current day/night configurations follow a pattern of day shifts being twice that of night shift, analysis of whole-of-year emergency calls for 2000 indicated that demand in the night shift warrants a larger deployment particularly in its first four hours.

4.6.16. The current "DDNOO" shift rotation can only achieve a 2:1 ratio of day to night ambulances. An alternative deployment has been investigated to address the apparent shortfall in night deployment versus that of the day shift, as well as the current shortfall in resources. A moderate revision will be to mix "DNNOO" shift rotations with the current rotation to achieve different shift ratios of day to night as compared to the current 2:1. In this way, some gains in efficiency might be achieved at some depots where the ratio of calls would indicate this more flexible rostering is advantageous.

4.6.17. Introduction, however, of the DNNOO shift rotations will increase the number of ambulances in the early evening and could be applied to reduce the very heavy utilization of some of the depots during that period. This is achieved at the expense of the day shift ambulance availability. On the other hand, the availability of any additional resources in the second part of the night shift is generally not beneficial.

4.6.18. A number of alternative options were investigated and it is proposed that a trial of the flexible Day/Night configurations be initiated at the following ambulance deployment points: Fanling, Kwai Chung, Tsing Yi and Tsim Tung.

4.6.19. In view of the above, it is considered that if the ratio between night calls and day calls increases, the "DDNOO" roster will not be appropriate. A mix of "DDNOO" and "DNNOO" rosters at the same depots may assist in ensuring ambulance availability at the times they are needed. A complication in introducing the "DNNOO" roster is that it is a substantial departure from the status quo. There may well be some concerns from the Ambulancemen's Union regarding this approach.

Swing Shift

4.6.20. A "swing" shift 4:00pm to 12:00am may also be usefully implemented in the future. Properly deploying ambulances on the swing shift will help smooth the early evening demand. This shift directly addresses the peak without the need to maintain resources during the overnight period when demand drops significantly.

	Start	End	Start	End
Current Shift	Day Shift		Night Shift	
	8:30 AM	8:30 PM	8:30 PM	8:30 AM
Swing Shift Proposed	4:00 PM	12:00 AM		

Table 4.7 Swing Shift Pattern

4.6.21. This shift will require additional ambulancemen and ambulances as it would overlap with the day shift. There are also difficulties for the ambulancemen deployed on this shift, many of them will rely on public transport to return home. Opening up this shift to any current ambulancemen who may want to work this shift as well as offering other incentives may show that it is viable. This warrants further consideration including consultation with the Ambulancemen's Representatives.

4.7. Better Information Management

4.7.1. Like many ambulance services throughout the world, FSD has a shortage of information on which to base strategic planning decisions. Deployment of resources, staffing configurations, clinical protocols, quality improvement and long range planning are best planned through detailed analysis of related information. The Ambulance Command needs to develop its information management systems and develop its capability in respect of analysis and planning. Currently, strategic planning based on analysis of related information is not possible with the limited information available.

4.7.2. The TGMS will provide FSD with the means of improving its planning. The Ambulance Command should firstly collect and capture relevant data on patients, dispatch locations and clinical care.

4.7.3. The Ambulance Command needs to also develop its capability to analyse the data from the clinical point of view and to liaise with the TGMS project team to include appropriate data fields within TGMS. TGMS needs to have or develop its capability in respect of:

- identifying patients having life threatening emergencies from other patients requesting EMS assistance;
- identifying the EMS assistance for callers (such as the location of a public access defibrillator);
- providing pre-arrival instructions for those patients with life-threatening conditions until ambulancemen arrive on-scene;
- providing a means of effectively coordinating those involved in ambulances, hospitals and from other emergency providers;

4.7.4. With the addition of the TGMS, FSD will have a better capability to carry out a comprehensive analysis of their operational performance on a day-to-day and even hour-to-hour basis. This information resource needs to be interfaced with the MIS giving FSD the opportunity of correlating system performance with patient care initiatives.

4.7.5. While TGMS will monitor and track call demand and performance and other agreed information, there will remain an inability to analyse and utilise recorded clinical data. Currently, relevant case data is collected on an ad-hoc basis and collection is labour intensive and inefficient. Current information gathering processes rely on hand collection, sorting and data entry. As a result of this manual collection and data entry, conclusions if questioned may be difficult to justify.

4.7.6. A suitable MIS with the potential to link with TGMS will provide timely and relevant performance and clinical data which will facilitate quality improvement activities, performance monitoring, reporting and planning in relation to pre-hospital care services. Ideally, such activities will involve HA. HA will also benefit from the information that would become available, as it would have clearer insight of the "determinants" affecting emergency health care demand.

4.7.7. The scope, objectives and functions of MIS in respect of clinical information needs to be developed through a separate study, however, its functions are likely to include capabilities to:

- Provide an evidence base to the clinical practice;
- Provide information to establish the level of compliance of paramedics with clinical protocols and procedures
- Provide information which enables comparisons between event assessments at the call-taking, in-field and hospital stages, for the purpose of refining dispatch protocols;
- Assist in determining training requirements at an organisational level based on patient outcomes;
- Assist in determining training requirements of individual paramedics as a consequence of clinical experience;
- Provide a ready means of investigating specific cases;
- Provide extensive validated information suitable for researching, developing and enhancing Hong Kong's ambulance services.

4.7.8. Databases for quality assurance need to be developed and maintained, with the capability of capturing information from various sources including the Hospital Authority.

4.7.9. Databases will also need to be developed and maintained for clinical performance and patient treatment/clinical care. In order to develop a "system profile", FSD will need to collect and analyse information related

to the types of patients treated, the skills applied, medications and treatments used; the success rates for particular skills, medications and treatments; and demographic information on patients, etc.

4.7.10. Patient demographic information will assist in planning and development of new and improved treatment protocols.

4.8. Customer Services and Relations

4.8.1. FSD need to establish a dedicated unit with responsibility for customer services and relations. This unit will be tasked with:

- Providing the public with a clear understanding of the role of the Ambulance Services;
- Educating the public regarding the proper use of ambulance services and how to deal with accidents or sudden illnesses including the call to 999;
- Educating special groups such as Property Managers, Security firms as First Responders;
- Collecting feedback and views regarding the Ambulance Services;
- Promoting the importance of pre-hospital cardiopulmonary resuscitation;
- Establishing a public image of the Ambulance Services.

4.8.2. These tasks will require intensive effort in the creation and dissemination of information. This information must be matched with the target audience so that it is effective. Target groups will include patients, students, elements of the community with high risk, homes for aged people, District Councils, the general public, those in the healthcare system of Hong Kong as well as Government departments.

4.8.3. A detailed program needs to be established involving the preparation of the material and its dissemination through questionnaires, posters, hotlines, web sites, videos, mobile counters, and participation in public events, seminars.

4.8.4. While much of these efforts can be a dedicated unit, it will also be important to involve all members of the Ambulance Command particularly those in the front line. The Customer Services and Relations Unit will need to plan and communicate the overall strategy, determine the role played by each member of the Command and ensure their familiarity with the material produced by the Unit. It will be the front line staff who introduce the questionnaires to the patients.

4.8.5. This unit must be led by a mature and capable representative of the Ambulance Command. The leader must be able to establish and

maintain a public image and effective working relationships with the local media. It is recommended that this unit comprises one Superintendent and two Senior Ambulance Officers (SAO). The Superintendent will report to DCAO and will liaise closely with the Information Unit of FSD who will assist him in dealing with the media. He will be responsible for developing and implementing the overall strategy and program and be the key person in the program delivery. One SAO will be responsible for preparing information for the public and for the education program while the other SAO will be responsible for dealing with community relations.

4.8.6. In view of the administrative work involved, the Customer Services and Relations Team needs two dedicated clerical staff to support its functions. These clerical staff will assist in ensuring the proper and prompt flow of information and the timely response to time critical communications. They will also assist in ensuring effective centralization of all information and the overall integrity of the Customer Services and Relations system.

4.9 Human Resource Issues

4.9.1. There are a number of issues that FSD must address in consultation with the ambulance officers, the ambulancemen and their representatives. These include:

- Surging demand for PAS.
- Flexible rostering.
- Priority dispatching system
- Development of the paramedical qualification.
- Recognition of paramedics.
- Increased training rates.
- Increased medical input into the service
- Utililisation of new technology.

5. LONGER TERM INITIATIVES NEEDED FOR PAS

5.1. Long Term Increase in Resources

5.1.1. FSD is experiencing a surging growth in the number of calls. International experience shows that the current growth levels are likely to continue. On a per capita basis, the number of emergency calls per head is still below other international cities (refer to Table 3.2 on page 3-2). While FSD will continue to optimize its deployment of ambulance resources to best meet recorded growth in calls, FSD needs to agree a formula, enshrined in policy, by which FSD can call on Government to commit additional needed resources on a yearly basis.

5.1.2. From detailed analysis of the UHU Rates for the ambulance fleet for the expected call numbers for 2001, 2006 and 2011 (refer to Section 3.1.12 and Attachment 4), it is clear that FSD will need to man more ambulances to ensure that its past response time performance can be maintained in the longer term. Analysis of response time performance at FSD's seven operational divisions shows that achievement of the current 92.5% pledge requires sufficient resources to ensure a UHU of less than 42% across each division. By projecting the number of calls based on Government population projections and calls/head of population, FSD can reliably determine the ambulance shifts needed to maintain its response time pledge. This approach needs to be recognized by an appropriate policy that will ensure the additional resources are secured in time to ensure performance.

5.1.3. Given the long lead time needed to secure additional manpower through Government's annual RAE and recruitment processes, it is imperative that FSD establishes future resource needs in advance of their demand such that the RT performance will always be maintained at or above the level pledged by FSD to the community. FSD must continue to maintain records of calls on a monthly basis and use the latest available information and any trends in demand and thereby maintain forecasts of the number of calls expected over the succeeding five years. Using its computer based model and the target UHU for each division, FSD should, at the last responsible moment in the RAE calendar, determine the ambulances needed for the year by which any additional resources could be made available.

5.2. Training

5.2.1. FSD is committed to continuously develop the EMA II program to better meet Hong Kong's needs. While the current EMA II curriculum is proprietary to the Justice Institute of British Columbia (JIBC), JIBC cooperates with this development. A structured approach to curriculum

development can address the long term training/educational needs of the service.

5.2.2. In consulting local stakeholders in FSD's PAS Review 2000, various representatives of the medical community responded with their advice. All supported the extension of the paramedic training and the review of the training program. By way of example of this feedback, one medical practitioner, Professor Robert A Cocks, the Director of the Chinese University of Hong Kong's Accident and Emergency Medicine Academic Unit, advised FSD it should consider alternative training programs. He felt that it was time to modify the training program to suit local conditions. He was concerned that the current EMA II program has included unnecessary material on one hand, and omitted locally important issues on the other. He made some positive suggestions in respect of paramedic training including:

- Specific proposals in respect of basic skills and medications;
- The formation of a Paramedic Steering Committee within FSD to support the work of the Medical Director. This would be chaired by a senior officer in charge of paramedic training and include independent support to the protocols and clinical decisions of the paramedic staff. This committee will need to have a broad base and as a minimum to include specialists in Emergency Medicine, Anaesthesia and Cardiology. This panel would determine the format, content and the medication list;
- The need to develop in the ambulanceman the ability to fully assess patients, to empower the trained paramedics to make appropriate clinical decisions and thereafter to support their professional judgement. This Paramedic Steering Committee would share any burden of responding to possible criticisms in respect of protocols;
- Various recommendations on the strategic deployment of PAS through a copy of his earlier article published in the British Medical Journal entitled "What does London need from its ambulance service?". This article concluded that:

> *"although response times have the highest profile – being easily measured – the quality of clinical care delivered is also crucially important, and its absence from the topics included in the service's annual corporate review is regrettable. …… Management commitment is likely to produce response times over the next three years, but this will be a hollow achievement without advances in clinical care."*

5.2.3. In considering this feedback it is worth noting that the four leading causes of death (largest first) in Hong Kong are cancer, circulatory/cardiac disease, respiratory disease, and trauma.

5.2.4. By way of example, the current recommendations from ILCOR are that the optimal medications to use for cardiac events/cardiac arrest are Vasopressin, amiodarone, lidocaine, atropine, epinephrine, dopamine,

beta-blockers, calcium channel blockers, adenosine, Furosemide, IV nitroglycerin, morephine and thrombolytics whereas the current EMA protocols provide for the use of Naloxone, nitroglycerin spray, Ventolin, thiamine, IV $D_{10}W$ and IV normal saline.

5.2.5. Similarly, while ILCOR states that the best treatment for slow heart rates is cardiac pacing and that the "gold standard" for airway maintenance is endo-tracheal intubation - the EMA II's are given skills in IV therapy, Combitube/LMA placement, nebulized medications and intramuscular injections, and the use of the automatic external defibrillator (AED).

5.2.6. Paramedics around the world perform all these skills as part of the ILCOR's recognized and scientifically researched cardiac resuscitation. Of the ILCOR's "standard of care" skills, it is only the use of the AED skills that EMA II's are able to perform.

5.2.7. As noted by a number of medical practitioners consulted in FSD's PAS Review 2000, Hong Kong needs to review the training of the paramedics, provide them with the clinical judgment, skills, medications and equipment that will enable them to provide the pre-hospital care their patients need.

5.2.8. The EMA II program has addressed many of the basic skill requirements of the service however it falls short in providing some important background knowledge that is required to develop the more advanced levels of care. These include basic microbiology, basic math and science. Evidence based practice would also be useful to enable better understanding and appreciation of treatment regimes. There are competencies, which could be built into the initial training and would ensure a minimum standard that would assist the more advanced training.

5.2.9. FSD needs a strategic five year development plan (Refer to Section 5.7 which elaborates on this) to address this whole program - EMA II program, initial ambulanceman training, continuing medical education, and specialized training needs.

5.2.10. In planning the longer term development of the EMA II program, FSD and its Medical Directors need to reassess the knowledge, protocols and skills needed by the paramedics in Hong Kong. Ideally this will be supported by a comprehensive collection of relevant clinical data.

5.2.11. The EMA II program currently requires re-certification. This is achieved through two weeks every three years. The introduction of a more effective quality assurance program will enable this training time to be used most effectively. Quality assurance program will assist in identifying areas that need to be addressed. Hospital and medical involvement is required for the program to be successful. (Refer to Section 4.3)

5.2.12. The collection of clinical data to determine training requirements and community health needs is essential to successful planning. Future paramedic education will also be derived from analysis of clinical data and the quality assurance program (e.g. adrenaline in cardiac arrest, aspirin in cardiac chest pain, issues related to skill maintenance).

5.2.13. Students have different needs and will experience success with educational material in different ways. Using a variety of different methods will ensure better outcomes. Developing future training materials using behavioural objectives and to appeal towards student needs for auditory, visual and kinesthetic learning styles will improve learning.

5.2.14. The Medical Director needs to regularly communicate with the EMA II ambulancemen. An opportunity for one-to-few sessions will be provided through the CME Programme. Regular issue of policy interpretations and information notes is also important. Increased interaction will allow for smoother flow of information from the bottom up. EMA II personnel will share successes with the Medical Director through improved interaction.

5.2.15. Universities can provide unique educational opportunities and those Universities that currently provide medical/allied health education programs should be approached in order to assist in training program development.

5.2.16. Partnering with a University or the HA may be a useful strategy. Such an arrangement will provide greater access to the needed educational resources. While the FSD with its limited resources may struggle to build a library and gather multimedia and computer based resources for its staff, the university environment is already geared to accomplishing this goal and will not only have the tools needed for this venture, but will also have the capability to assist FSD in developing its own specialized training material in Cantonese.

5.2.17. Universities could serve as an access point for reference materials, textbooks etc. Using their improved economies of scale along with their pre-established networks to gain access to vendors for pre-hospital education materials can serve to the FSD's advantage.

5.2.18. Partnering with a University may lead to accreditation of the EMA II program. The curriculum could then be developed in an environment that is educationally sound and designed to reinforce all important critical thinking skills essential for paramedics of the 21st century. It will be through the use of the academic process of review and information collection.

5.2.19. The involvement of the HA will facilitate access to a broad base of clinical specialists and medical professionals, who through the didactic and

clinical phases of education, will enhance the critical thinking skills that EMA II requires.

5.2.20. By working closely with the HA, FSD can instigate a system wide approach to the management of specific patient conditions. For instance, trauma systems have been developed around the world to improve the management of acute trauma patients. Evidence shows that diversion strategies which ensure individual hospital is not overloaded with trauma patients are essential in improving outcomes. This is achieved through effective training of the paramedics in triage. Introducing system wide planning will be an important contributor to planning of future educational programs. The resource implications of any diversions through a hospital bypass protocol need to be carefully analysed and understood before implementation.

5.2.21. Clinical databases are needed for monitoring clinical performance and patient treatment/clinical care. Demographic information will enable introduction of new and improved treatment protocols targeted toward those who will benefit the most.

5.2.22. Reviewing treatment protocol compliance and successful skills/procedures performance, and the associated patient outcome data will provide information on the best practice treatments for a particular condition.

5.2.23. Treatment protocol compliance will alert the Medical Director to protocols that may be efficacious, but not necessarily efficient. When completed successfully, treatment protocol compliance correlated with patient outcomes will identify best practice and best patient care scenarios.

5.2.24. The paramedics will need to continue to develop their clinical skills. The increased utilization of the current EMA trained paramedics to provide in field clinical support will facilitate this goal.

5.2.25. Developing a mentoring program will enhance the overall quality of patient care within FSD. As there is an increase in complexity of the requirements for providing patient care, the need for additional support cannot be oversighted. Mentors within the FSD can provide guidance and suggestions to new staff members as well as serve as positive role models.

5.2.26. Analysis of successful skills/procedures performance versus the number of attempts in relation to the number of patients requiring the skill will point to areas that need redress, or upon further evaluation, may require an updated device or even releasing that procedure/skill/medication to the repertoire of the advanced practitioner.

5.2.27. In addition to continuing to provide basic life support ambulance service and critical inter-facility transport to area hospitals, FSD needs to provide clinical customer focused service to internationally recognized performance standards (courtesy of ILCOR – International Liaison Committee on Resuscitation).

Acute Cardiopulmonary Emergencies

5.2.28. FSD is encouraged to promote the concept of the chain of survival by encouraging through public education the need for early access, CPR, and defibrillation in the community. Hong Kong's high-rise buildings lend itself to First Responder groups (such as Property Managers, Security Companies) within the high rise buildings. This will be a task for the Customer Services and Relations Team. The further development of the EMA II program may usefully be focused on cardiac arrest in the first instance. The practice of providing a defibrillator on every ambulance should be continued as it is considered best practice in emergency medical systems. Apart from those technical competencies mentioned, it is important to incorporate training in effective communication between the ambulance crew and the A & E Department staff to ensure effective on-line information flow and hand-over of the patient's condition. The following initiatives are recommended:

- promote public education on the recognition and initial management (e.g., EMS system access and CPR) of these conditions;
- identify patients having, or at risk of having, a serious cardiopulmonary condition;
- the introduction of new assessment skills to the EMA II personnel for assessing stroke patients (use of the Cincinnati Pre-Hospital Stroke Scale or the Los Angeles Stroke Score), heart attack patients (using 12 EKG), and patients with congestive heart failure;
- the introduction of expanded cardiac/respiratory medications and resuscitation skills including, but not limited to:

  cardiac pacing
  end tidal CO_2 detection
  12 lead EKG
  endotracheal intubation
  use of medications such as amiodarone, epinephrine, vasopressin, lidocaine, diltiazem, adenosine, beta blockers, thrombolytics, steroids, IV nitrates, furosemide, bumetanide, sodium bicarbonate and aspirin

- update and expand the current treatment protocols to allow use of the technology and medications as described;
- Early Access - ability to access a central emergency phone number and receive pre-arrival instructions prior to the arrival of ambulances;

- Early CPR - the ability to receive cardio-pulmonary resuscitation from family, friends, by-standers;
- Early Defibrillation - the ability to receive defibrillation as soon after the victim goes into cardiac arrest – ideally with public accessible defibrillation available community wide;
- Early Advanced Cardiac Life Support - to receive advanced cardiac life support as to the standards recognized by ILCOR.

Multi-system Trauma

5.2.29. The FSD has an opportunity to work with the HA to instigate a system wide approach to the management of specific patient conditions. Trauma systems have developed around the world to improve the management of acute trauma patients for instance. The available evidence suggests that the number of trauma patients being presented to the A & E facility is critical to improve outcomes. FSD can assist through proper training and triage. The resource implications to the PAS of any hospital bypass protocol need to be carefully analysed and understood before implementation. The following initiatives are recommended:

- promote public education regarding injury control;
- identify patients having, or at risk of having, a traumatic condition;
- identify with the HA those facilities (e.g. hospitals with the appropriate support for trauma patients) which are best able to provide efficient and effective trauma care;
- develop with the HA the clinical indicators for call screening by the FSCC, and trauma triage by the ambulancemen on-scene;
- develop screening criteria based on anatomic, physiologic, and mechanism of injury indicators that will allow for appropriate diversion of patients to appropriate hospitals rather than nearest A & E Department;
- improve pre-hospital care by incorporating new skills and the associated treatment protocols for the following:

  rapid sequence intubation using paralytics
  needle chest decompression for tension pneumo-thorax injuries
  pneumatic anti-shock garments for patients in shock
  surgical cricothyrotomies

- reduce time between the trauma incident and definitive care through pre-hospital triage and primary transport that facilitates transportation of patients to the most appropriate facilities.

5.2.30. Other initiatives which will be investigated further in order to develop specific EMA II program enhancements include:

Burns

- promote public education regarding burn care and burn prevention;
- identify appropriate criteria for the diversion of burn patients to burn centers by adopting the recommended criteria of internationally recognized authorities such as those of the American Burn Association;
- develop expanded treatment protocols for burn patients to include pain management (use of morphine sulfate) and advanced airway procedures (endotracheal and nasotracheal intubation, rapid sequence intubation, and surgical cricothyrotomies).

Craniospinal Injuries

- promote public education regarding injury control;
- identify patients having, or at risk of having, craniospinal injuries, and identify possible concurrent emergency conditions;
- provide training for ambulance personnel in the proper management of spinal cord injuries;
- introduction of improved treatment protocols to include the use of steroids for the patient who has suffered a craniospinal injury.

Poisonings

- promote public education regarding the prevention of poisonings;
- include new medications for treating drug overdoses and the appropriate protocols for:

  flumazenil for benzodiazapine overdose
  digoxin immune FAB for treating digoxin overdose

- identify patients having, or at risk of having, a toxicologic emergency, and recognize potential public health hazards.

Neonatal and Pediatric Emergencies

- promote public education regarding neonatal and pediatric emergencies;
- provide training for ambulance personnel in the special aspects of neonatal and pediatric emergency medical and critical care;
- outfit all ambulances with pediatric specific equipment including:

  pediatric backboards
  pediatric/neonatal cervical collars
  pediatric endotracheal intubation equipment and supplies
  pediatric defibrillation pads and defibrillator capable of defibrillating pediatric patients
  pediatric IV catheters

intraosseous needles

- include medications, skills and treatment protocols for pediatric patients such as:

  epinephrine
  sodium bicarbonate
  naloxone
  dextrose
  intraosseous IV placement

- identify A&E hospitals (with the HA) with facilities for handling a full range of pediatric emergencies.

Acute Psychiatric and Behavioral Emergencies

- identify patients having, or at risk of having, a serious psychiatric or behavioral condition;
- provide public education programs about drunk driving and similar public safety issues;
- provide training for ambulance personnel in management of intoxicated, drug impaired, violent, and psychologically disturbed patients.

5.2.31. Most of these tasks can be accomplished concurrently (such as education and data collection) but this is the logical progression for FSD in its evolution to a full PAS.

Clinical Support

5.2.32. FSD may also offer a small incentive for staff to undertake some education/training using learning packages that could be developed in partnership with a University that has expertise in distance education.

5.2.33. The current educational curriculum and teaching strategies need to be further developed in depth. Partnering with the HA and the Universities, will be valuable in developing the FSACTS into a true paramedic training academy.

5.2.34. The Hong Kong Council for Academic Accreditation (HKCAA) is an appropriate party for accrediting courses provided jointly by the University and the paramedic academy. Accreditation of a paramedic academy by the HKCAA would necessitate a more formalized clinical training relationship with the HA and institutions accredited by HKCAA.

5.2.35. The HKCAA will evaluate a course/institution for qualification after:

- Conducting an institutional evaluation to assess its suitability for awarding of qualifications, and the evaluation of its general academic environment and processes;
- Evaluating the proposed program to assess its comparability with other programs in Hong Kong and in respect of international standards.

5.2.36. Liaising with the Committee for the Accreditation of Allied Health Programs (a part of the American Medical Association) may boost efforts to gain accreditation as they currently accredit paramedic programs in the United States and would provide an international benchmark for the program.

5.2.37. Currently the Civil Service Bureau (CSB), the Education and Manpower Bureau (EMB), the Education Department, the Social Welfare Department and other parts of Government of the Hong Kong Special Administrative Region (Hong Kong SAR Government) formally use the HKCAA to provide authoritative advice on the standards of qualifications. In particular, the CSB and the HKCAA work together through a Qualifications Assessment Liaison Group to consider activities and issues regarding qualifications and academic awards for Government appointment purposes. This would assist FSD in developing its goals in respect of paramedic training and qualification.

Other Strategies

5.2.38. Other strategies will be needed in the longer term to continue improving efficiency and effectiveness:

- Ongoing development of the curriculum is essential to ensure that the EMA II training program best meets the needs of the community and FSD. The future interests of Hong Kong will best be served by developing FSD's own curriculum for its various programs rather than rely on the curriculum developed by, and proprietary to, the Justice Institute of British Columbia.

- Recruitment needs to be targeted on individuals capable of completing paramedic training. This will widen the core competencies across FSD to better respond future demands of the service.

- Consideration should also be given to recognition of prior knowledge for the EMA II course. This may produce candidates that can be fast tracked through e.g. anyone that has a recognised university degree (such as the Bachelor of Health Science (Paramedic)) may be exempted from the 2-week preparatory workshop of the EMA II training. This would be something the Clinical Management Committee may consider (section 4.3.16).

- Develop a mechanism for credentialing of individuals who may have an equal or higher level of education (such as nurses, physician assistants, paramedics trained outside of Hong Kong, etc.,) applying for positions within FSD.

Management Training Support

5.2.39. Management training in regard to the concepts and principles of ambulance operations and quality assurance will be essential. As the FSD moves ahead to an all EMA level of service, the need to assure quality will assume a larger role. All ambulance officers will need to be trained in quality assurance in order to properly assess the personnel under their command.

5.2.40. Additional training for senior and front-line management as well as different levels of paramedical training will be needed in the longer term. External training resources may be deployed for specialized training of paramedics. Deploying external training resources will give FSD flexibility in how and when they provide these courses.

Supporting Infrastructure

5.2.41. The FSD intranet can be used for communications and to provide on-line clinical education in the future.

5.2.42. Communications between the staff of the FSACTS and the Depot Commanders or ambulance staff could be accomplished quickly and efficiently. For instance, an internet connection will allow paramedic crews to access public domain information resources such as those in university libraries, from other EMS organizations or as provided directly by publishers.

5.2.43. Video materials for continuing education or clinical updates could be presented over the FSD intranet to reduce the time needed to update personnel on certain issues. The video could be stored on-line and accessed again and again as needed.

5.2.44. Written evaluations may be presented on-line, graded immediately all from within the ambulance depot.

5.2.45. Training materials in the form of handouts, charts, references, etc., could be emailed or posted to a secure web site for review by the ambulance staff. This assumes the accessibility of the FSD intranet at convenient locations to the ambulancemen.

5.2.46. On-line reference material regarding medications, disease's etc., would be available in all depots 24 hours a day, 7 days a week, to assist the staff

with any questions. This should be procured from recognized publishers such as Medline (full text), Embase, or equivalents.

5.2.47. Policies and treatment protocols could be easily updated and the relevant information could then be distributed instantly with an intranet.

5.3 Mobilisation

Dispatch Prioritization

5.3.1. Dispatch prioritization is a key to utilizing the current resources in a more efficient manner.

5.3.2. Currently calls are addressed on a next in queue basis.

5.3.3. A patient facing a serious emergency may have an ambulance driving past their location to respond to another assignment as they were next in the queue.

5.3.4. With prioritization, a more serious emergency may have an ambulance diverted from one assignment to the location of a more serious assignment. TGMS would support this.

5.3.5. Implementation of an algorithm for prioritization of calls is essential to the new PAS. Manual diverting of ambulances from assignments of low priority to assignments of high priority will be vital. Having the ability to prioritize emergency calls, FSD may also see the need to withhold ambulances in reserve to ensure their availability to handle life-threatening emergencies. Low Category ambulance calls may need to be withheld if only one ambulance is available. This may need to be recognized in the performance measure for response. A reasonable algorithm needs to be developed for this.

Ambulance Triage

5.3.6. With the Hospital Authority further consolidating its specialty services, it will be important to agree with the Hospital Authority specific procedures for field triage of patients.

5.3.7. The future selective diversion of patients to the most appropriate hospital with specialized service will be based on the service network and be best addressed through the Hospital Authority's Sub-Committee on Pre-Hospital Care. Designation of specialty centers is the domain of the Hospital Authority.

5.4. Operations

5.4.1. The following strategies may be considered in the longer term if they lead to greater efficiencies and effectiveness:

- As more detailed information becomes available in relation to response time performance in different zones, strategies involving wider dispersing of the fleet may be introduced to reduce travel time and improve response time performance.

- New target response times for different categories of call may be considered, e.g. 8 minutes for cardiac arrest, 12 minutes for emergency calls, 30 minutes for semi-emergency calls. This combination of grading would provide greater flexibility in mobilizing ambulances for better response and a more effective service.

- TGMS is capable of recording and making readily available to the console operator information regarding buildings with problems such as difficult lifting issues and thereby facilitates the most appropriate response. FSD needs to collect this building information in a systematic manner. The response may then be tailored to the address. In the longer term for instance, it may be possible to consider reducing the manning of each ambulance. One of the principal justifications of Hong Kong's three man crews is the difficulties in transporting patients in the older buildings with either no elevators or elevators that are too small to operate within. Once the location of high rise buildings with difficult access is confidently determined, then alternative deployment proposals may be considered.

5.4.2. When FSD completes its transition to full PAS, all ambulances will be capable of meeting any types of service request. With a service-wide EMA II capability, a fully integrated clinical information system, and with the use of efficient data retrieval systems, FSD will have the ability to plan deployment and dispatch based on demand. Flexible rostering strategies will enable FSD to achieve higher levels of productivity while maintaining efficiency, cost-effectiveness, and safety.

5.4.3. Investigation of dynamic deployment of ambulances and the use of two or three man staffing patterns should be explored and developed in depth as relevant information is collected in TGMS.

More Flexible Rostering

5.4.4. Call demand needs to be continuously monitored and assessed. Growth in calls is increasing by around 7.6% per annum. While this is partly the

result of population increases and an ageing population, these do not account for all the increase in calls. In any event the patient requirements for care are changing and the current skills and services need to respond to the changing needs of the community.

5.4.5. Currently, patient demand for service and traffic congestion tend to cycle predictably and coincidentally on a daily basis. While the current demand can be satisfied with 12-hour shifts and current skills and practices, FSD will need to evaluate alternative staff rosters that may better meet new trends in demand.

Event driven redeployment

5.4.6. The geographic patterns of demand for ambulance services may cycle widely - reflecting the free movement of people across the Territory and their changing patterns of behavior. This is in sharp contrast to the demand for fire services which arise from incidents within buildings – the location of which are fixed. FSD needs to closely monitor and identify the cyclical patterns of call demand including its geographic distribution. There is also a need to identify patterns of traffic congestion. Strategies for deployment and redeployment of ambulances should be developed to match patients' need for service.

5.4.7. The outcome of these volume-demand and geographic-demand analyses will be an array of system status plans that define pre-agreed deployment, and redeployment strategies for Hong Kong. FSD needs to develop - ready for use - several system status plans, each of them integrates seamlessly with TGMS.

5.4.8. TGMS has the capability to facilitate dynamic posting of ambulances based on pre-defined system status plans and this capability needs to be exploited once available.

5.4.9. At this stage, it is premature to institute such a dynamic rostering strategy including event driven deployment. Such strategies and plans must be derived from a solid and substantial record of data gathered and analysed on a geographical basis. The implementation of TGMS may provide the means of introducing these strategies and plans, although it is recognised that, at present, TGMS does not specially provide such functionality within its specification.

5.4.10. The ability to re-assign responding ambulances from calls of low priority (e.g. in Hong Kong, “non-EMA” and “urgent”) to higher priority calls (e.g. “EMA”) is common across best practice PAS. Similarly the functions of protocol based systems include:

- giving pre-arrival instructions until help arrives on-scene;

- deploying or redeploying of ambulances to reduce response time;
- dispatching first responders to improve on scene treatment time.

5.4.11. Call screening and issuing of pre-arrival instructions are key functions of best practice PAS systems and as it currently stands, Hong Kong does not match any of the internationally recognised best practice PAS in this area.

5.5. Other Technological Improvements

5.5.1. FSD will have the capability through TGMS to analyze its own needs and provide improvements as trends are recognized. TGMS will also facilitate enhanced communications between the A&E departments, the Fire Services Communications Center (FSCC) and the ambulances in the field.

5.5.2. Enhanced data collection and storage within TGMS could provide the information needed for multidimensional graphing. FSD could have the ability to produce demand profiles based not only by call on an hour to hour basis, but also by region and specific locations. This detailed analysis will provide an improved picture for planning and deployment. It will support future justification for increased manpower/resources.

5.5.3. FSD needs to develop and implement an MIS with a clinical information system capability that links with the TGMS. Data collection should have a consistent format and content.

5.5.4. Incorporating a digital patient recording device coupled with an interface to TGMS, will allow for a detailed and systematic acquisition of clinical data, matched to the dispatch data.

5.5.5. Electronic data concerning patient conditions, treatments etc., could also be transmitted directly to the A&E Department, alerting them to the impending arrival of patient(s).

5.5.6. Age profiles for patients of different categories will allow development of better designed clinical care protocols. Trends in particular regions of Hong Kong can be analyzed, and then can be determined if it is an issue confined to a particular area, or it is an issue of Hong Kong as a whole.

5.5.7. Continuous quality improvement data will be instantly available for analysis. Patient care, use of particular skills, procedures and treatments, will be analysed more efficiently.

5.5.8. Continuous quality improvement analysis will alert the management when there are patterns or trends in care that need to be immediately addressed, whether or not this patterns or trends are systematic or confined to an individual. It will also monitor the success of the quality improvement process.

5.5.9. Success rates for particular skills or procedures can be recorded and analysed not only for the gross numbers of procedures performed, but also for success rates for individual paramedic. This will point the way toward whether a skill deficiency is a system or individual problem.

5.5.10. Paramedics equipped with Personal Digital Assistant could perform their quality audits in the field and upload this information into the TGMS. Linked with clinical data captured in the field, FSD will have true measures of performance.

5.5.11. Linking patient outcome information with the clinical information captured in the field, without access to patient personal information, so as to protect patient confidentiality, will enhance analysis of "best practice" patient care treatments.

5.5.12. Statistical information needed for planning can be gathered and analysed.

5.5.13. Data can be accessed and analysed on an instantaneous basis rather than collected/compiled and then analysed in the current laborious fashion. With improved technical performance, feedback will be more timely and efficient.

5.5.14. Performance data can then be posted on a daily/weekly basis. This is a key factor for success in a Quality Assurance Program. Posting of information will encourage the staff to seek new levels of improved performance.

5.5.15. Currently each hospital has a radio for communications between ambulance and the hospital. Equipping the radio with an auditory/visual alerting mechanism will allow the hospital staff to answer the radio and not have to continuously monitor the frequency. When the ambulance wants to alert the A&E Department, they will activate mechanism in the ambulance, setting off the auditory/visual warning devices alerting the hospital staff to an incoming radio call. The adoption of effective hands-free communication equipment by the ambulance crew would facilitate early and continual communication with the hospital without hindering delivery of care to patient.

5.5.16. FSD also needs to utilize the Government intranet, for improved communications between all ambulance depots, the FSACTS, the Ambulance Command headquarters and the FSCC. Email access as well as access to electronic reference material, on-line versions of policy and treatment protocols are essential to the smooth and continued operations of an organization as diverse and complex as FSD.

5.5.17. The use of email will allow staff daily updates to critical information, and will be a more efficient form of communication. Access to electronic

reference material, for any advanced level pre-hospital care organization, is key to their success. The ability to reference new medications and unfamiliar medical conditions is a basic ability found in every hospital in Hong Kong.

5.6. Emergency Medical Response and Critical Care Transport Teams

Emergency Medical Response

5.6.1. Developing an additional trained emergency medical response team will enhance the PAS for Hong Kong.

5.6.2. It is recommended that personnel selected for a special operations team to be trained to the EMA II level, and should receive a further 80-120 hours of additional advanced training, in order to bring their current skill to a level equivalent to an internationally recognized level such as the United States EMT-Intermediate Standard.

5.6.3. This upgrade would be an interim step based on the additional medications and protocols that would be required (as well as the addition of endotracheal intubation) to be put into use for such a team.

5.6.4. Team members should also receive training in basic and advanced care of the HAZMAT patient, as well as training to the HAZMAT technician/operational level training.

5.6.5. Air-operations could be conducted on a limited basis, with the focus being on short-term air-evac, say from an outer area to a trauma center. In order to use the team for on-scene flights of long duration/operation greater than 20 minutes (this would be a combination of on-scene/flight time), a greater degree of education of training would be essential.

5.6.6. Air-evac training is especially important in regards to inter-facility transports from anywhere in the SAR, back to a specialized service center for specialized treatment (burns, paediatrics/neonatal, trauma, etc.), when the team has a greater understanding of new skills and techniques. For example, more advanced skills such as rapid sequence intubation, using paralytics, cricothyrotomies, other more advanced medications, etc.

5.6.7. Implementing the Emergency Medical Response Team will require:

- Developing specifications for equipment ordered for a special operations detail. This would be important to have in place prior to training so that the team would have the opportunity to train with the equipment ahead of time.
- Upgrading skills of the selected EMA II personnel to those required for

special operations.
- Developing the policies, procedures and protocols for treating "special situation" patients.
- Training special units for special operations.
- Developing training exercises and methods of evaluation.

5.6.8. Such a team could function with an upgraded EMA II level complement of 8 paramedics per shift, and a further 4 to 6 for operational support. It is envisaged that these resources would carry out regular ambulancemen duties when not deployed on special operations. Further definition of this establishment, together with investigation of the needs and justification for this team needs to be undertaken.

Critical Care Transport

5.6.9. The Critical Care Transport Team will be highly trained group that is prepared to transfer the sickest or most seriously injured patients between hospital facilities.

5.6.10. Due to the specialized condition of these patients, FSD will need to assign paramedics with an understanding of the special needs of critical patients during transport. These paramedics also need to become familiar with hospital procedures and equipment, and to develop the skills needed to maintain the stability of the patient during transportation.

5.6.11. Implementing the Critical Care Transport Team will require:

- Developing specifications and equipment ordering for critical care transport units. Equipment compatibility is one of the most crucial issues. The compatibility of the equipment between the HA and FSD's ambulances has to be assured when FSD adopts specifications for equipment. If, for example, the IV pump drip sets are incompatible with the IV pumps between the HA and FSD, it will create complications and increase on-scene time. It is also imperative to have the equipment in place prior to training so that the team will have the opportunity to train with it.
- Upgrading skills of the selected ambulance Supervisors to those required for critical care transport.
- Developing treatment protocols designed to treat critical care transport patients. Policies and procedures for critical care transport operations would need to be designed during this phase. Mechanisms for on-line and off-line medical control also need to be developed.
- Defining quality assurance mechanisms specific to the critical care transport.

5.6.12. The training program for Supervisors of the critical care transport team will last for about three weeks and will include:

- The Critical Care Transport Environment In Hong Kong;
- Management of patients with the following conditions: Respiratory, Surgical Airway, Pharmacological, Renal, Neurological, Hemodynamic, and Cardiac;
- Special transport considerations relating to the special cases of Burns, Pediatric, Neo-natal, Obstetrics and Gynecological;
- Case studies; and
- Clinical Attachment.

5.6.13. Options for providing training for critical care transport teams include:

- Train the Trainer where staff are trained at a critical care transport program and then implement the program back in Hong Kong
- Sending all the staff overseas to acquire training
- Recruiting experts to come to Hong Kong to present the program
- Developing an "in-house" program independent of anyone else.

5.6.14. The preferred recommendation would be to first send some staff overseas completing their training in critical care transport. Based on their experience, select an appropriate vendor to provide the training in Hong Kong. This vendor should first conduct a needs assessment to tailor the program to Hong Kong's situation.

5.6.15. In 2000, there were 8,696 emergency transfers between hospitals. This amounts to 24 calls per day. This number will be impacted by HA's policies regarding specialised service centers. It is recommended that once it is decided to implement this proposal, an initial group of 24 EMA IIs be trained for critical care transport. As the HA's policies on specialised service centers are established this number will need to be reviewed. It is also proposed that this critical care transport becomes part of, and extension to the UC fleet (section 4.6.9 – 4.6.14). This will mean that the UC fleet will need to be extended to cater for these EC calls, however, this will be offset by an equal reduction in the number of shifts required for other EC Calls.

5.7. Strategic Plan

5.7.1. FSD is not only experiencing increasing calls for ambulance services but is also subject to increased expectations from the community, its ambulancemen and stakeholders. These pressures are shared by other PAS around the world as growth in calls outstrips population growth. These challenges can only be met by adopting long term strategies that change the current system.

5.7.2. There is a need to develop a strategic five-year development plan that

addresses all the elements that are under review by FSD. Projects and initiatives need to be bundled into a single plan for implementation. This will provide a context to the changes required and assist in negotiations with key stakeholders. It will give a timeframe for meeting the demands and reduce the risk of setting targets that may not be able to meet.

5.7.3. A five-year strategic plan will provide FSD with a clear roadmap for the substantial changes it is progressing. In order to develop this plan they will need information – for example, trends analyses with a focus on outcomes. This information will enable FSD to define its needs and priorities for operations, as well as the justification for instituting new treatment protocols. By recognizing the importance of patients' outcomes such as mortality and morbidity, FSD can develop its focus on the operational strategies, the most relevant clinical skills and the quality assurance program that ensures success.

5.7.4. Some of the initiatives are complex and all of the initiatives will impact the workforce and other major stakeholders. For example recommended improvements include:

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- Basing decisions on clinical data. i.e. match skills, pharmacology etc. to the needs of the HK community;
- Targeting responses to 'known' incidents with the aid of TGMS. i.e. paediatric cardiac arrest, major critical trauma;
- Introducing 'on scene' clinical support and audit functions.

5.7.5. FSD must review its scope of ambulance services and strategies and develop new initiatives such that the value of its ambulance operations to the community and other stakeholders continues to be appreciated. FSD will need to have the ambulancemen's and other stakeholder's ownership of these initiatives and therefore should aim to involve the stakeholders including the unions in the development of the plan. This will give the service a greater level of confidence in moving forward with its initiatives.

5.7.6. In its "Paramedic Ambulance Service Review 2000", FSD made enquiries to PAS of various ambulance services within six developed countries – USA, UK, Canada, Australia, New Zealand and Singapore. The areas of focus included:

- any tiers in ambulance services offered
- qualifications of ambulance personnel
- dispatching criteria or protocols
- types of ambulances provided

5.7.7. The outcome of this exercise was primarily that all countries investigated provided a paramedic level of personnel and that some had a more advanced level of paramedic capability than Hong Kong.

5.7.8. While this current Study has reviewed many important functions and aspects of current services, FSD, in developing its strategic plan, will need to identify a number of specific best practice PAS for benchmarking Hong Kong's PAS on a wider range of performance related issues. In addition to those areas of focus already identified these should include:

- performance measurement
- response times
- pre-arrival instructions
- quality assurance
- continuing medical education
- Computer Aided Dispatch (CAD) systems
- first responders
- working relationship with health authorities
- information systems
- ambulance manning
- multi-skilling of ambulancemen
- utilization rates
- front line management skills
- rostering

5.7.9. In order to gain a broad perspective on international best practice and it is important that this list does not focus on a few elite PAS, but those serving a substantial population. Appropriate models include:

- London, UK (covers metropolitan London only)
- British Columbia, Canada (covers whole State)
- Melbourne, Australia (covers whole state)
- New York, USA
- San Francisco, USA
- Tokyo, Japan

5.7.10. Further performance measures for clinical quality assurance and system performance benchmarks can be developed by the Quality Assurance team as data is collected.

5.7.11. Benchmarking against international best practice may lead FSD to propose widening its current utilisation of the AAMC as Hong Kong's *First Responder* capability. This First Responder capability can be more fully exploited (and expanded) once the more effective telephone triage/call screening is implemented with FSD's commissioning of the new TGMS. International best practice PAS all utilize some form of system status management and provide a First Responder program. The goal of any call screening telephone triage system is to manage the available resources in the most efficient manner, including re-assigning the needed resources to patients who require the most advanced care as soon as possible.

5.7.12. Call screening and issuing of pre-arrival instructions are key functions of best practice PAS systems. The introduction of TGMS will provide the opportunity for Hong Kong to meet internationally recognised best practice PAS in this area.

5.7.13. Issuing of pre-arrival instructions is an innovative approach aimed at enhancing the survival rate of patients. Given the potential impact on staff resources, it is recommended that the adoption of pre-arrival instructions is initially introduced on a trial basis and limited to critical cases such as cardiac and unconscious patients. Detailed investigation of the mode of operation in respect of issuing of pre-arrival instructions is also needed.

6. RECOMMENDATIONS

6.1. Increased Establishment (refer to para 4.1.1 to 4.1.3, 3.6.1 and 5.1.1 to 5.1.3)

6.1.1. With the projected growth in calls, the shortfall in ambulances is increasing. Secure as part of the annual RAE process (with the ambulance availability of 212 in 2001), a further 29 ambulances (for a total of 241 ambulances) by April 2002 and an additional 10 more ambulances (for a total of 251 ambulances) by April 2003. In addition, the following additional ambulance depots will be needed by 2006 or 2011, as noted:

Region	Area	Provided by	Remarks
H	Aberdeen	2006	To replace existing facility at fire station
	Chai Wan	2006	To replace existing facility
	Sheung Wan	2006	To replace existing facility at fire station
K	Kowloon Tong	2006	New provision
	Wong Tai Sin (2nd Depot)	2006	New provision
	Shun Lee	2006	To replace existing facility at fire station
	Kwun Tong	2006	New provision
	Lai Chi Kok	2006	New provision
	Mong Kok	2006	To replace existing facility at fire station
	Tseung Kwan O (3rd Depot)	2006	New provision
NT	Kwai Chung	2006	To replace existing facility at fire station
	Pak Shek Kok	2006	New provision
	Sheung Shui	2006	To replace existing facility at fire station
H	Tung Lo Wan	2011	To replace existing facility at fire station
NT	Fanling (2nd Depot)	2011	New provision
	Hung Shui Kiu	2011	New provision

6.1.2. Review each year the resources needed to meet the forecast demand based on most recent trends such that any additional resources can be committed through the annual RAE process in time to meet any shortfall. In determining the resources needed, adopt a target Utilization Rate (UHU) for each operational division of 42%.

6.1.3. Secure commitment of any additional needed resources through the Annual RAE process.

6.2. Transition to Full PAS (refer to para 4.2.1 to 4.2.8)

6.2.1. Implement the full provision of PAS as soon as possible by training more than 500 paramedics by April, 2005. Specifically, this will require:

6.2.2. Relocating (on a temporary basis) the initial recruit training to FSTS at Pat Heung.

6.2.3. Undertaking temporary alterations and additions to the FSACTS at Ma On Shan to provide the facilities for the EMA II program.

6.2.4. Increasing the number of annual graduates from the current level of 48 to 192 EMA II paramedics per year.

6.3. Advanced Recruitment to Meet Accelerated PAS Upgrade Training (refer to para 4.2.4 and 4.4.6)

6.3.1. Secure an advanced allocation of ambulanceman posts - a total of 10 officers and 40 ambulanceman posts. The head count of 10 officers and 40 ambulancemen arises from the need for 10 trainers and the coincident involvement of 40 trainees from the concurrently running EMA II training programs. Assuming that the accelerated EMA II training is initiated in April 2002, the trainees need to be released from active duty for the training program.

6.3.2. Retain this advanced allocation beyond the completion of the EMA II training program to enable the release of EMA II qualified personnel to complete their ongoing CME, and the necessary triennial re-certification, as well as EMA I Training and the EMA I Training Update. Refer to the projection of the training commitment as shown on Table 4.2.

6.4. The Medical Director (refer to para 4.3.3, and 4.3.8 to 4.3.17)

6.4.1. Ensure that the Medical Director has a major role in the development and delivery of the EMA II programs and develops protocols for clinical care, triage and audit for the EMA II program. Other tasks should include

- Conducting re-certification and continuing medical education for the EMA II qualified personnel.
- Providing clinical and medical advice to FSD in relation to mass casualty and clinical management and care.
- Overseeing the clinical services of FSD and ensuring effective communications with the HA and hospital medical staff.

6.4.2. Increase the involvement of the Medical Director - in the short term (by January 2002), providing Medical Director sessions equivalent to two half time positions, increasing by April 2003 to the equivalent of three half time positions.

6.4.3. Appoint the first Associate Medical Director by January 2002 to provide support to the FSACTS, deliver lectures for the initial training program, the EMA II program, CME programs, refresher programs and any other programs that may be needed at the FSACTS. He will also assist in developing the curriculum, identify training needs of the Ambulance Service, and plan a yearly training calendar as well as a 5-year strategic

plan for training and education.

6.4.4. Appoint the second Associate Medical Director by April 2003 to oversee the quality assurance program, and to continuously evaluate performance and the system for areas of improvement. He will identify staff who require remedial training, and will develop a yearly plan with goals and objectives for the quality assurance program as well as a 5-year strategic plan for quality assurance.

6.5. Quality Assurance Team (refer to para 4.3.20 to 4.3.33)

6.5.1. Appoint a QA Team comprising an officer of Superintendent rank, assisted by two officers of Senior Ambulance Officer rank, and two dedicated clerical staff for data entry, data processing, filing, report generation, as well as data analysis for QA auditors prior to their supervision sessions, keeping logs of certified paramedics, ensuring re-certification for paramedics within the required time frame. Also commit the substantial involvement of one operational Ambulance Officer from each depot and the duty Ambulance Officers from each region to undertake all the field audits.

6.5.2. Adopt a profiling approach for auditing all paramedics. This is to involve logging of all cases processed by paramedics, initially by hard copy and filing, and in future by electronic data entry.

6.5.3. Introduce electronic data collection and analysis in real time mode.

6.6. Customer Services and Relations Team (refer to para 4.8.1 to 4.8.6)

6.6.1. Establish a dedicated unit comprising an officer of Superintendent rank, two officers of Senior Ambulance Officer rank, and two dedicated clerical staff with responsibility for customer services and relations.

6.6.2. Task this unit with:

- Providing the public with a clear understanding of the role of the Ambulance Services;
- Educating the public regarding the proper use of ambulance services and how to deal with accidents or sudden illnesses including the call to 999;
- Collecting feedback and views regarding the Ambulance Services;
- Promoting the importance of pre-hospital cardiopulmonary resuscitation;
- Establishing a public image of the Ambulance Services.

6.7. Human Resources Issues (refer to para 3.7.2 to 3.7.8)

6.7.1. Recruit and select new ambulancemen on the basis of criteria that are most relevant to the new PAS.

6.7.2. Seek approval of the permanent status of the EMA II special allowance for Senior Ambulanceman and Principal Ambulancemen and its extension to qualified Ambulancemen.

6.7.3. Establish a comprehensive Occupational Health and Safety Plan.

6.8. Special Operations Teams (refer to para 5.6.1 to 5.6.15)

6.8.1. Introduce critical care transport teams for inter-hospital transports of critically ill and injured patients in categories such as cardiac, burns, neonatal, pediatric, and trauma.

6.8.2. Provide these critical care transport teams with specialized equipment, medications, training and protocols. Establish appropriate CME and quality assurance programs for these teams.

6.8.3. Introduce emergency response teams to handle treatment of patients exposed to hazardous materials, injuries of patients from building collapses, trench rescue and confined space. Provide these teams with specialized equipment, training and specific treatment protocols and operational procedures for team deployment. Establish appropriate CME, and provide Joint training between the Ambulance Service and the Fire Service to ensure effective operations. Define mechanisms to critique assignments and evaluate performance.

6.9. Training (refer to para 5.2.1 to 5.2.39, and 5.7.1 to 5.7.13)

6.9.1. Continue to develop the clinical skills of paramedics beyond the EMA II level aimed at encouraging the long-term development of the paramedic skills within the Ambulance Command.

6.9.2. Collect clinical and operational data. Analyze the data to determine training needs and community health needs. Use performance and quality assurance data to identify the future needs of new skills.

6.9.3. Enhance patient care by expanding the EMA II program to improve the clinical judgment of the paramedics and include the new skills, medications, equipment and treatment protocols necessary to treat cardiopulmonary, cranio-spinal, poisoning, neonatal, pediatric, trauma and burn patients. Provide for increased clinical training beyond the

current EMA II standards for these added components.

6.9.4. Increase the CME contacts in order to increase the opportunity for Medical Director and EMA interaction. Use case review workshops, lectures, presentations, directed research, etc. as opportunities for the Medical Director to interact with the staff. Incorporate new topics or discuss issues that the Medical Director has identified.

6.9.5. Incorporate some additional training into the recertification process to further advance the cognitive and psychomotor skills of the EMA II staff. Use internationally recognized programs, for example, Advanced Cardiac Life Support and Pre-Hospital Trauma Life Support, as part of the refresher curriculum to introduce new skills and information. Use skills workshops, hospital and field clinical performance evaluations to assess competencies. Align the PAS competencies with the national minimum competencies being developed in other developed countries.

6.9.6. Enhance the ambulancemen's initial training course to include some basic protocols that better address Hong Kong patient's needs. This should include the administration of nebulized salbutamol and nitroglycerin spray. Evaluate new skills and treatments for inclusion into the initial training of ambulancemen as they become available. In addition, all EMA I trained ambulancemen should receive an annual EMA I Training Update. This would be of 2 days duration and should be introduced after the EMA I Training is complete.

6.9.7. Provide training for the HAZMAT and critical care transport teams. Assess the unique needs that for CME and competency assessment. Develop programs to meet those needs.

6.9.8. Identify the specific needs of frontline officers for continuing management training. Provide this continuing management training on an ongoing basis. Develop a mentor program for all ranks for employee development and quality improvement.

6.9.9. Develop a five-year strategic plan specific to training and education. Assess the needs of the community and FSD and develop a Hong Kong specific paramedic curriculum designed to reinforce critical thinking skills using behavioral objectives. Include in the curriculum the concepts and principles of ambulance and evidence based practice. Seek accreditation of this program through the Hong Kong Council for Academic Accreditation.

6.9.10. Introduce new methods of supplying educational clinical information. Computer based learning packages, internet based programs and video tapes are just some of the methods that can be used to deliver course content and information. Examine other EMS/ambulance education programs worldwide to see what is being done.

Ambulance Command Training School (FSACTS) *(refer to para 4.2.5, and 4.4.1 to 4.4.18)*

6.9.11. Increase the capacity of the FSACTS to meet the EMA II training needs. Adopt innovative training methods in line with international best practice.

6.9.12. Step up the program for basic EMA II to run 8 EMA II courses per year with 24 students per course. Continue re-certification, CME, annual advanced air-way management training and initial recruit training.

6.9.13. Pending extension of the FSACTS at Ma On Shan, undertake all the initial recruit training at the FSTS at Pat Heung. Also fit-out areas of the FSACTS to provide additional classrooms, simulation rooms and offices sufficient to meet all the concurrent paramedic training by no later than end March 2002.

6.9.14. Commence as soon as practicable the project for extending the FSACTS at Ma On Shan in accordance with the preliminary schedule of accommodation to meet the detailed training program.

6.10. Deployment (refer to para 4.6.1 to 4.6.21, and 5.4.1 to 5.4.11)

6.10.1. Review current deployment to address the heavy utilization in individual depots as identified by the computer model provided by the Consultants including exploration of various strategies (and combinations of these) such as extended day shift, flexible day/night configurations, the swing shift and a dedicated UC fleet with an aim to achieve response time performance or other improvements.

6.10.2. Investigate introducing an extended day shift (12:00 noon to 12:00 midnight) for some depots to better address the heavy demand through to 12:00 midnight and provide FSD with a further means of optimizing the system performance.

6.10.3. Investigate introducing flexible day/night configurations for some depots for high ratio between night calls and day calls.

6.10.4. Investigate introducing swing shift and a dedicated fleet to address Urgent Calls.

6.10.5. Continue to collect and analyze all operational data and develop plans specific to the most recent demand profile, taking into account any unique situations encountered that will require system changes.

6.10.6. Develop system specification and procedures with the objective of most

usefully utilizing the current staffing levels.

6.11. Mobilisation (refer to para 4.5.1 to 4.5.14, and 5.3.1 to 5.3.5)

6.11.1. Improve the efficiency and effectiveness of the FSCC Console Operators by providing training specific to emergency medical dispatch and by developing their capability to adopt a defined structured call taking process and function within an agreed system and framework. Introduce pre-arrival instructions. In the longer term, introduce priority dispatch grading patient needs in line with available paramedic skills including those beyond EMA II.

6.11.2. Adopt protocols that will best support the PAS. Review available protocols in regard to the dispatch criteria for call triaging. Ensure that the selection of the dispatch algorithms that best meets PAS needs and includes a mechanism for changing the dispatch algorithm.

6.12. Technology (refer to para 4.7.1 to 4.7.10, and 5.5.1 to 5.5.17)

6.12.1. Collect all pertinent response information and Implement measures to gather clinical and quality assurance data electronically.

6.12.2. Develop and implement an Ambulance Service Management Information System which includes clinical information system functionality and links with TGMS and possibly the HA.

6.12.3. Develop management reports based on system, quality and clinical key performance indicators.

6.12.4. Further investigate introduction of DTMF encoders for ambulance to hospital communications. This will reduce demands on the console operator to relay information, and it will also produce a more timely notification of hospital A & E departments of critical cases. It will also enable physicians to have on-line medical contact for critical patients, improving the quality of clinical care.

6.12.5. Investigate upgrading the radio communications to ensure that it can support bi-directional communications between the ambulance crew and the HA's A&E Department staff.

6.13. Resource Implications

6.13.1 The recommended initiatives for implementation are categorised in the following Table 6.1 in terms of their anticipated resource implications.

6.14. Implementation Plan

6.14.1. Adopt the detailed implementation plan (see Attachment 10) which has taken into account all relevant factors and constraints. The financial implications of full provision of EMA II services in 3 years are at Attachment 11.

6.15. Further Study

6.15.1. In view of the significant and long-term changes that the full provision of PAS will bring to Hong Kong's ambulance services and the way they are managed, conduct a further study of the services with a focus on the roles and functions of management within the new PAS regime. This Study should address the complexity of the issues facing FSD as highlighted in this Report including the introduction of best practices and the future collaboration required with the relevant agencies such as the Department of Health and the Hospital Authority.

	Recommendations	Priority	Resources Needed
	SHORT TERM INITIATIVES (Immediate through to Q1/2003)		
1.	Investigate introducing flexible day/night configurations (para 6.10.3), staggered shift arrangement (para 6.10.2)	High	Low
2.	Secure the commitment of the additional manpower (10 officers and 40 ambulancemen) (para 6.3.1)	High	High
3.	Increase the number of EMA II paramedics by 192 per year, continue recertification, CME, annual advanced air-way management training and initial recruit training. (para 6.2.1, 6.2.4 and para 6.9.12)	High	High
4.	Investigate and review the roles and responsibilities of frontline ambulance officers, particularly with respect to their role in quality assurance. (para 6.9.8 and 6.15.1)	High	Low
5.	Carry out temporary alterations to the FSACTS (6.9.13, 6.2.3)	High	Low
6.	Develop User Requirements for the Ambulance Command's Clinical Information Management System (para 6.12.2, 6.12.3)	High	Low
7.	Develop protocols for introducing Structured Call Taking and Pre-arrival instructions (para 6.11.1)	High	Low
8.	Plan and secure earmarking of funding for the extension of the FSACTS (6.9.14)	High	Low
9.	Utilise the Fire Services Training School at Pat Heung for the Initial Training (6.9.13, 6.2.2)	High	Low
10.	Provide for greater involvement of Medical Director (para 6.4.1, 6.4.2, 6.4.3, 6.4.4))	High	High
11.	Introduce a dedicated QA Team (para 6.5.1 and 6.5.2)	High	High
12.	Introduce a dedicated Customer Services and Relations Team (para 6.6.1 and 6.6.2)	High	High
13.	Seek approval of the permanent status of the EMA II special allowance for Senior Ambulanceman and Principal Ambulancemen and its extension to qualified Ambulancemen. (para 6.7.2)	High	High
14.	Establish a comprehensive Occupational Health and Safety Plan (para 6.7.3)	Medium	Low
15.	Develop a five-year strategic plan specific to training and education (para 6.9.9)	Medium	Low
16.	Introduce new methods of supplying educational clinical information. (para 6.9.10)	Medium	Low
	MEDIUM TERM INITIATIVES (Q2/2003 to Q4/2004)		
1.	Implement the Clinical Information Management System (para 6.12.2)	High	High
2.	Gather Clinical Information System Data in the field electronically (para 6.5.3, 6.12.1)	High	Low
3.	Build the Extension to FSACTS (para 6.9.11, 6.9.14)	High	High
4.	Secure retention of advanced recruitment for ongoing training programme (para 6.3.2)	High	High
5.	Review the Dispatch Algorithms used by the Control Centre (para 6.11.2)	High	Low
6.	Introduce Pre-Arrival Instructions from Console Operator to the Caller (para 6.11.1)	High	High
7.	Introduce DTMF Encoders and improved radio connections between ambulances and the Accident and Emergency Departments of hospitals (para 6.12.4, 6.12.5)	High	Low
8.	Introduce a dedicated fleet to address Urgent Calls (para 6.10.4)	Medium	Low
9.	Introduce Critical Care Transport Teams and HAZMAT Teams with special training (para 6.8.1, 6.8.2, 6.9.7)	Medium	High
10.	Introduce swing shifts (para 6.10.4)	Medium	High

Recommendations	Priority	Resources Needed
LONG TERM INITIATIVES (Q2/2005 to Q4/2006)		
1. Introduce Emergency Response Teams with special training after full provision of PAS (para 6.8.3)	Medium	High
2. Introduce Prioritised Dispatch after full provision of PAS (para 6.11.1)	Low	High
ONGOING ORGANIZATIONAL IMPROVEMENTS		
1. Review deployments at each depot to best match demand with calls (para 6.10.1, 6.10.5 and 6.10.6)	High	Low
2. Further developing both the EMA I and the EMA II Training Programme (para 6.9.1, 6.9.2, 6.9.3, 6.9.5, 6.9.6)	High	Low
3. Increase CME contacts between the Medical Director and paramedics (para 6.9.4)	High	High
4. Secure a substantial increase in manpower and other resources that are urgently needed (para 6.1.1 and 6.7.1)	High	High
5. Gain Bureau's commitment to link provision of ambulance resources to ambulance calls (para 6.1.2, 6.1.3)	High	Low
6. Provide more Ambulance Depots (para 6.1.1)	High	High
7. Maintain Recertification and Refresher Programmes (para 6.3.2)	High	High

Table 6.1 Timing and Resources Implication of Recommendations

In Table 6.1, the items classified as having a high priority are expected to result in a significant enhancement to the ambulance services, with those having a low priority expected to have a less significant enhancement, and those with a medium priority having an appreciable enhancement – more than those with low priority. Items classified as requiring high (level) of resources will require commitment of recurrent expenditure or major capital expense whereas those requiring a low (level) of resources require a moderate capital expenditure with relatively minor recurrent cost if any.

Attachment 1 – Comparison of FSD's with FDNY's and LAS's Ambulance Services

Our team has been in contact with both London Ambulance Services and the Fire Department of New York.

It is clear that response time performance for New York is comparable with Hong Kong while the London performance is significantly below that of Hong Kong.

Comparison with Fire Department New York

Emergency responses for 2000 were 1,192,000. (down on 1999)

Shift duration is 8 hours
Morning shifts average 347 for 2000
Afternoon/early evening 346 for 2000
Overnight shifts 240 for 2000

FDNY has 410 ambulances but also controls a large number of hospital owned ambulances that respond to Emergency Calls from particular geographical areas.

Following the same calculation basis as for FSD, the UHU for FDNY ambulance services is **36.3%.** This does not allow for move-ups and the time spent on move-ups is not recorded or available. They do not believe this is a major issue. They believe that their street corner deployment managed by their in-house Map Info GIS is very effective in matching responses to calls.

Number of responses per 8-hour shift averages **3.5**. (FSD is **4.8** for their longer shift.)

Of the 1,192,000 emergency responses, the number of transports to hospital is 65.8%.

Number of calls per equivalent 24-shift (adjusted for shorter duration of non-transports) averages **8.0**. (FSD is **8.5** also adjusting for non transports)

FDNY employs 2,677 ambulancemen. They are deployed 2 per ambulance. Their shift roster is 5 days on, 2 off, 5 on, 3 off. This is equivalent to a 37.5 hours per week. This compares with FSDs roster which is equivalent to a 48 hours per week. Their manning ratio for 24 hour equivalent shift is 11.

These staff resources do not include those manning the non FDNY ambulancemen. (i.e. those crews manning the hospital owned ambulances.) We estimate that the resources need to man all the turned-out shifts will be approximately 3,477 i.e. 2677 + 800. This corresponds to 680 emergency responses/crew.

Growth in emergency calls for New York is now quite nominal. This is due to various health initiatives such as the wellness programmes and outreach clinics.

Regarding deployment FDNY has 27 ambulance depots. Since 1981, they use a street corner deployment of ambulances. Fire stations are not used at all. They track number of calls closely and they have the flexibility provided by the hospital owned and manned ambulances and also are able to use overtime payment of their own crew as a means of meeting seasonal variations in demand. For instance in July 2000 they have rostered an average of 982 shifts.

Response time performance is good. They average 6 minutes and 40 seconds for responses to life threatening cases.

FDNY provides fire engines as first responders. Fire engines are within 3.5 to 4 minutes travel time of whole catchment. The engines have a response time performance of less than 6 minutes. First responders are backed up by EMS.

Comparison with London Ambulance Services

Emergency Responses for 2000-01 700,000

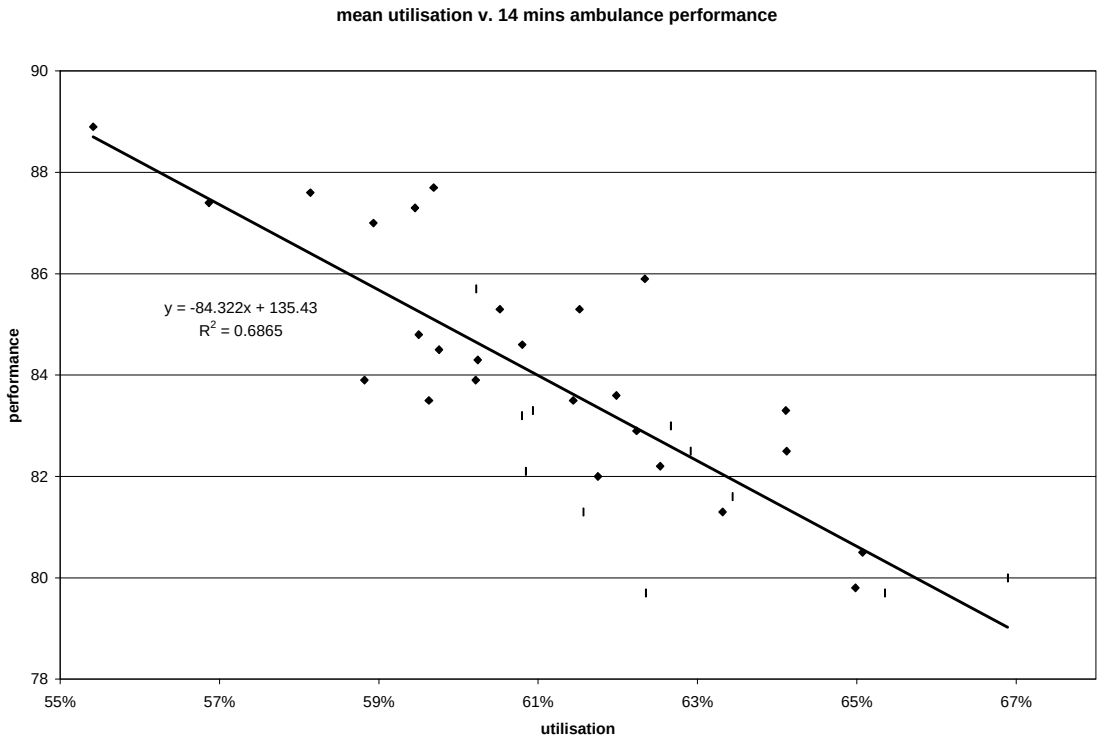
LAS has 391 A&E Ambulances. This does not include ambulance motorcycles (10) and rapid response vehicles (number not available).

The UHU is currently more than 10 % over their target (ie 50%). They are failing to meet the target response times with current performance as follows:

Call Type	Target Response Performance	Actual Performance	
		8 minutes	14 minutes
Cat A	75% at 8 minutes	41.8%	83.3%
Cat B/C	95% at 14 minutes	35.2%	79.7%

Of LAS's 700,000 emergency responses, around 80% (543,900) result in transports to hospitals. This ratio is low when compared with Hong Kong. LAS state the reason for this ratio is:

- Patient are not at address when response arrives
- Patient is dead
- Patient refuses to travel
- Transport not needed



LAS says that the average utilisation for a week has a close relationship with the performance for that week. Because the utilisation measure currently used in the LAS excludes cars and motorbikes, it correlates much more closely with their 14 minute ambulance performance for all calls than with the 8 minute one, that includes any responder. Their graph above shows that there can be a close relationship between their RT Performance Vs utilization and is, based on 37 weeks worth of data. The relationship demonstrates that high utilization represents poor RT Performance.

LAS currently assign around ***1,500*** Ambulancemen to A&E duties. These work in 2 man crews. The number of responses/two man crew is currently around ***950***.

Overall Conclusions

HK's UHU is higher than FDNY, lower than LAS's. (FDNY is 36.3%, FSD is 40%)
HK's responses/crew/pa is higher than FDNY, lower than LAS. (FDNY is 680, FSD is 733, ***LAS is 950***)
HK's responses per equivalent 24-hour shift (with adjustment for non-transports) is higher than FDNY. (FDNY is 8.0, FSD is 8.5)
HK Ambulancemen work longer hours. (FDNY is 37.5/week, FSD is 48/week)
HK's response time performance is similar but not as good as FDNY, but significantly better than LAS).
HK's calls per head is much less than both FDNY and LAS but rapidly catching up.

The choice of these two locations provided a very useful comparison with Hong Kong. In broad terms, we see FSD as currently sitting between both London and New York in terms of response time performance. Poor response time performance of London Ambulance

Service is currently being addressed by them – however they advised that their UHU is still much too high.

Attachment 2 – Forecasts of EC and UC Calls

This attachment explains briefly how the forecasts of EC and UC Calls were derived. Projected values are derived by extrapolating, using statistical methods and the recorded data.

Forecasts for the number of Emergency Calls (ECs) has been derived by projecting both the calls/head of population and the population.

Year	Recorded Pop'n	Recorded EC calls	EC/ Head	*Forecast Pop'n*	Forecast EC calls	U call	Total
1991	5,752,000	234,211	4.07%			65,523	299,734
1992	5,800,500	251,058	4.33%			60,674	311,732
1993	5,901,000	268,943	4.56%			60,815	329,758
1994	6,035,400	289,289	4.79%			62,581	351,870
1995	6,156,100	317,749	5.16%			63,873	381,622
1996	6,484,300	347,607	5.36%			65,086	412,693
1997	6,564,200	367,064	5.59%			67,574	434,638
1998	6,645,600	394,493	5.94%			69,250	463,743
1999	6,720,700	421,146	6.27%			63,071	484,217
2000	6,789,559	459,658	6.77%			59,614	519,272
2001			*7.04%*	***6,854,060***	*482,694*	*60,000*	*542,694*
2002			*7.44%*	*6,919,173*	*514,559*	*60,000*	*574,559*
2003			*7.85%*	*6,984,906*	*548,526*	*60,000*	*608,526*
2004			*8.29%*	*7,051,262*	*584,737*	*60,000*	*644,737*
2005			*8.76%*	*7,118,249*	*623,337*	*60,000*	*683,337*
2006			*9.25%*	***7,239,320***	*669,428*	*60,000*	*729,428*
2007			*9.76%*	*7,384,106*	*721,042*	*60,000*	*781,042*
2008			*10.31%*	*7,531,789*	*776,636*	*60,000*	*836,636*
2009			*10.89%*	*7,682,424*	*836,515*	*60,000*	*896,515*
2010			*11.50%*	*7,836,073*	*901,012*	*60,000*	*961,012*
2011			*12.14%*	***7,938,371***	*963,873*	*60,000*	*1,023,873*

The population predictions for 2001, 2006 and 2011 have been taken from the Planning Department's (Transport Studies and Central Data Section) 2000-based Territorial Population and Employment Data Matrix (TPEDM).

Assumptions for calculating the ECs:

1. The growth in ECs is proportional to the growth in population.
2. Population is predicted from the 2000-based TPEDM).
3. Urgent Calls (UCs) are 60,000 per year from 2001 to 2011.
4. The current trend in the growth of EC Calls/head of population will be maintained.

Attachment 3 – Recent Development in the Ambulance Services

Government has committed significant additional resources to FSD in respect of Ambulance Services over the last three years. The details of these are described below.

(A) Additional Posts of Other Ranks Created since 1997

Item	*FY*	*Pr Ambm*	*Snr Ambm*	*Ambm*	*Total*
For manning 23 retained ambulances to implement ORH consultant's recommendation for 97/98. (Note: 23 surplus ambulances as the result of hiving-off of non-emergency ambulance service to HA & AMS.)	97/98	2	5	90	97
For manning 13 additional ambulances to implement ORH consultant's recommendation for 97/98	97/98 98/99	2	10 10	30 47	42 57
For manning 18 additional Ambulance Aid Motorcycle	97/98 00/01		20 16		20 16
For manning 10 ambulances for Tung Chung Ambulance Depot	97/98 98/99	5 1	9 21	28 45	42 67
For manning 2 additional Mobile Casualty Treatment Centre (MCTC)	97/98 98/99			4 4	4 4
For manning 5 additional ambulances to implement ORH consultant's recommendation for 98/99	99/00		16	33	49
For manning 3 additional ambulances to implement part of ORH consultant's recommendation for 99/00	00/01		5	25	30
Total		10	112	306	428

(B) Additional Vehicles since 1997

Financial Year	*Ambulances*	*Motorcycles*	*Others*
97/98	29	11	1 MCTC for New Territories Region
98/99	-	-	1 village ambulance for maintenance reserve
99/00	11	-	1 medium truck & 1 medium van for FSACTS
00/01	3	9	1 MCTC for Hong Kong Region and 3 medium saloon car for Operational divisions

(C) Additional / New Ambulance Projects completed since 1997

Unit	*Date of Commissioning*
Tung Chung Ambulance Depot	30.5.1997
Lam Tin Ambulance Depot	1.8.1997
Sham Tseng Ambulance Depot	23.3.1998
Pak Tin Ambulance Depot – (Reprovisioning of Pak Tin Ambulance Station)	21.10.1999

(D) Committed Projects (Funding Approved by the Public Works Sub-Committee)

These facilities are needed in view of the demands, RT performance and strategical elements in the respective areas.

Project Title	*Proposed Start*	*Target Completion*
Tseung Kwan O Fire Station-cum-Ambulance Depot in Area 87	Dec 2000	Aug 2002
Tin Shui Wai Fire Station-cum-Ambulance Depot in Area 112	May 2001	Nov 2002
Sha Tau Kok Fire Station with Ambulance Facilities	Dec 2001	Jul 2003
Braemar Hill Fire Station-cum-Ambulance Depot	Jan 2002	Oct 2003

Attachment 4 – Relationship between Calls and Fleet Size

The number of ambulance shifts needed to respond to calls for emergency services is related to the number of calls. This relationship is determined from the following assumptions/factors regarding the capacity of the fleet.

T - Average Time Taken for each Call (assumed to be 50 minutes since operational data given by FSD justifies using this average time value)

UHU - Utilization Rate (assumed to be 42% since Section 3.1.12 shows that UHU must be maintained below 42% in order to ensure achievement of the 92.5% RT performance pledge in each of the operational divisions)

MF - Efficiency factor for Move-ups (assumed to be 90% since the number of move-up cases is about 10% of the total ambulance calls in 2000)

TO - Turn-out Rate of Ambulances (assumed to be 91% since the actual ambulance availability in 2000 is about 91% of the authorized fleet size)

SF - This factor (1.2) assumes that the UHU of individual depots can be stretched on the basis that adjacent depots within the same Division can provide support and that the recommended maximum UHU can be maintained across the Division.

Table A4.1 below shows the size of the Fleet. The fleet size for the period 1991 through to 2000 has been adjusted to take into account the transfer of "RC" Fleet to the Hospital Authority.

Year	Emergency Calls	Urgent Calls	Total EC and UC	EC and UC Fleet (ambulances)	Ambulances Added
1991	234,211	65,523	299,734	141	-
1992	251,058	60,674	311,732	151	10
1993	268,943	60,815	329,758	156	5
1994	289,289	62,581	351,870	160	4
1995	317,749	63,873	381,622	169	9
1996	347,607	65,086	412,693	181	12
1997	367,064	67,574	434,638	185	4
1998	394,493	69,250	463,743	189	4
1999	421,146	63,071	484,217	208	19
2000	459,658	59,614	519,272	210	2

Table A4–1 Fleet Size and Calls for the period 1991 to 2000.

Table A4.2 below shows the forecast calls and fleet size needed. The extrapolation of "EC Calls" is described in Attachment 2. The EC and UC fleet for 2001 shows an increase of 21 ambulances. This is a sharp increase when compared with the following years and reflects a shortfall of 10 ambulances in 2000. While the number of calls increased 8.8% in 2000, FSD were able to secure less than 1.0% increase in resources. RT Performance reduced from 93.30% to 92.67% and could have been lower. The forecast fleet sizes (for 2001 through to 2006) are derived from the computer planning model (see Attachment 5) which

adopts the assumptions/factors specified above in its calculation. In order that the calculation is able to simulate the real situation, another factor called "Stretch Factor" with value 1.2 has been applied to raise the threshold for the UHU at each depot or station. The value of this factor is determined by the validation of the calls and fleet size in 2000.

Year	Emergency Calls	Urgent Calls	Total EC and UC	Ambulances Needed	
				Day Shift	Night Shift
2001	*482,694*	*60,000*	*542,694*	***231***	***119***
2002	*514,559*	*60,000*	*574,559*	***241***	***124***
2003	*548,526*	*60,000*	*608,526*	***251***	***129***
2004	*584,737*	*60,000*	*644,737*	***263***	***134***
2005	*623,337*	*60,000*	*683,337*	***275***	***140***
2006	*669,428*	*60,000*	*729,428*	***292***	***148***

Table A4–2 Forecast Calls and Fleet Size Needed for period 2001 to 2006.

Some key assumptions used in developing the data included in the above table are:

1. The Emergency Calls (EC) for 2001 and 2006 were calculated using the population statistics available from the Transport Department's most recent Comprehensive Transport Study.

2. The growth trend of the ECs was derived from the historical data gathered from 1991 to 2000. This growth trend was used to interpolate population and henceforth, ECs for 2002 to 2005. (see Attachment 2 for more details)

3. The forecast size of the whole Ambulance Fleet is determined by the sum of EC Fleet at each depot which is calculated according to the following formula:

$$\text{EC Fleet at each depot} = \frac{\text{ECs \& UCs for depot x Average service time (hours) for each call}}{\text{UHUx MF x TO x SF x Shifts x 12 (hours)}}$$

where:

ECs - No. of Emergency Calls per 24-hour for each depot
UHU - Utilization Rate: 42%
MF - Efficiency factor for Move-ups: 0.9
TO - Turn-out Rate of Ambulances: 0.91
Shifts - generally 1.5 (Most depots operate on a "DDNOO" duty pattern and for every 2 ambulances on day shift there will be 1 ambulance on night shift. The model takes account of the calls taken by the night shift by reducing the overall number of calls at these depots/stations by this factor of 1.5. A factor of 2.0 is used if the number of ambulances deployed for day and night shifts are equal. Alternative variations are also possible.

SF - This factor (1.2) assumes that the PAS can be stretched further (by increasing level of efficiencies, commitment and other intangibles) with a limiting

control on resources and is determined by the validation of the calls and fleet size in 2000.

4. The number of ECs is assumed to be proportional to the forecast population classified by age structure. The age structure comprises 10 age groups as defined by the Planning Department in their Technical Note on the Compilation of 2000-based TPEDM:

   0-3, 4-7, 8-11, 12-17, 18-24, 25-34, 35-44, 45-54, 55-64, 65+

5. Urgent Calls (UCs) have been assumed to be constant at 60,000 per year from 2001 to 2006.

6. Distribution of population catchments are taken from the Planning Vision and Strategy Zones.

The bulk of Hong Kong's ambulance calls arise in the urban area. Many of these depots are now over-extended (UHU greater than 42%). While there are some under-utilised depots/stations, these are limited in number. The resources assigned to each cannot be redeployed due to their remoteness (e.g. the Outlying Islands, Victoria Peak), or their strategic location (e.g. Chek Lap Kok, AFC) reasons and risk management. The number of calls taken by Hong Kong's 17 less heavily lowly utilized depots/stations amounts to only 6.0% of the overall volume of calls, while representing more than 14.7% of its resources. Table A4–3 shows the UHU and annual calls for all these Depots and Stations Depots.

Region	*Division*	*Depot/Station*	*Type*	*Day Shift*	*Night Shift*	*EC Calls Y2000*	*UHU*
HK	W	Cheung Chau	Fire Station	1	1	2,023	25%
HK	W	Discovery Bay	Fire Station	1	1	589	7%
HK	W	Mui Wo	Fire Station	2	2	572	4%
HK	W	Peng Chau	Fire Station	1	1	487	6%
HK	W	Tai O	Fire Station	1	1	439	5%
HK	W	Cheung Sha	Fire Station	1	1	382	5%
HK	W	Lamma	Fire Station	1	1	339	4%
HK	E	Chung Hom Kok	Fire Station	2	1	2,358	20%
HK	E	Victoria Peak	Fire Station	1	1	1,748	15%
NT	S	Tung Chung	Depot	4	4	2,203	7%
NT	S	Sham Tseng	Depot	2	1	1,937	16%
NT	S	Chek Lap Kok	Fire Station	2	1	1,289	11%
NT	S	AFC	Fire Station	2	2	825	5%
NT	W	Mai Po	Fire Station	2	1	2,963	25%
NT	W	Pat Heung	Fire Station	2	1	2,917	24%
NT	W	Tai Lam Chung	Fire Station	2	1	2,742	23%
NT	E	Sai Kung	Fire Station	2	1	2,526	21%

Region	Division	Depot/Station	Type	Day Shift	Night Shift	EC Calls Y2000	UHU
			Totals	**29**	**22**	**26,339**	

Table A4–3 Depots with Lower Utilization (Year 2000 data).

Attachment 5 – Description of Computer Planning Model

This attachment summarises the planning model, methodology employed, detail of inputs to the program and the results generated.

The purpose of this planning model is to project future resources required by the FSD.

Methodology

The model is built on an analysis of the calls generated by each individual location in the SAR as defined by using FSD's Location System from the VALS (Vehicle Availability and Location System) Code Book. All calls are assigned to the nearest Ambulance Depot or Fire Station with ambulance resources within or adjacent to the location/area of the call.

It is assumed that the number of calls arising from each location in Hong Kong is directly proportional to the population within the area. By using the Planning Vision and Strategy (PVS) Zones, the demographics of the population can be used to determine numbers of calls. At present the model makes use of the age group breakdown of population. The model uses the population by age group as the basis of projecting the total number of emergency calls. The model uses data recorded by the Hospital Authority in respect of admissions at their Accident and Emergency Departments. These records, after verifying with the sampling data provided by FSD, correspond to those patients arriving by ambulance. The forecast calls arising from the analysis described above are then adjusted such that it is consistent with the calls recorded in the year 2000. These adjustment factors are also used for projections for subsequent years.

The calls from each location are determined from data relating to the Government's PVS Model and these, in turn, are translated into the calls assigned to each depot or fire station. Finally, the resources for that depot or fire station are calculated from the number of emergency and urgent calls arising at the related locations.

Using the Computer Planning Program

Population Worksheet

The first step in building the model is to review the population worksheet. The model incorporates the latest available population worksheets for 2001, 2006 and 2011. These could be replaced or updated or alternatively new worksheets could be developed or obtained for intermediate years. These may be obtained from Planning Department. The worksheet should contain the population for each PVS Zone based on the following Age Groups: 0-3; 4-7; 8-11; 12-17; 18-24; 25-34; 35-44; 45-54; 55-64; 65+

PVS Zones within Specific Locations

The respective PVS Zones (from 1- 338) are entered for each specific location as defined in the VALS. The boundaries of the PVS Zones are defined by Planning Department. Before going to the next worksheet, a check is carried out by the Model to ensure that the PVS Zones are properly entered (i.e. there is no repetition).

Input of PVS Zones within specific locations

The Standard Codes for Ambulance Stations/Depots and Fire Stations with PAS facilities are entered. The PVS Zones from which calls are assigned to the specific depot or station are also entered.

The corresponding Urgent Calls for the depot or station are defined in the same table.

The inputs for PVS Zones are verified and possible repetition of zones is reported by the Model.

Inputs for Other Variables

There are four variables to consider for calculating the number of Emergency Call Fleet needed. They are the Utilisation Rate, the Move-up Factor, Turn-out Factor and the Stretch Factor.

The Utilisation Rate is a measure of both the utilization and availability of its resources.

$$\frac{\text{Shift hours spent on calls (from initial response to standing down at hospital)}}{\text{Total actual shift hours}}$$

The Move-up Factor takes account of the time spent in moving ambulances from a certain depot or station to an alternative depot or station to serve calls from other locations.

The Turn-out Factor takes into consideration the actual ambulance availability.

The Stretch Factor assumes that the crew's capacity can be stretched further by increasing other intangible factors such as rate of efficiencies, commitment level, etc. while holding a limiting control on the resources (i.e. EC Fleet Size). The value of this factor is determined by the validation of the calls and fleet size in 2000.

Outputs from the Planning Model

Ambulance Shifts required

Depending on the number of depots or stations input, the model will generate, for each, the number of day shifts and night shifts required. Since the program assumes that the shift pattern is 2:1 (ratio of Day:Night), the fleet size required during the day is always twice that

of those required at night with the exception of certain depots and stations (e.g. Offshore Islands and other strategic locations) where constraints are set.

The results generated for each station include the recommended number of shifts for each depot or station. The Ambulance Command will have to check that against the actual situations such as accommodation for ambulances, differentiation between the day and night calls and special needs, etc.

Ambulance Facilities required

The model can determine the locations in which new ambulance facilities should be provided. If the model shows that the number of ambulance shifts required at a specific location exceeds the maximum capacity of the existing ambulance facility in that location, another ambulance facility will be needed to accommodate the recommended ambulance resources.

The model is able to determine the number of ambulance shifts required in a developing area. This can be done by assigning, for the developing area under consideration, a simulated resource code and then re-assigning the relevant PVS zones which fall within the catchment of this resource code. The model determines the number of ambulances needed in this developing area by the design year and hence whether the need for a new ambulance facility is substantiated in this area for the design year.

With the above methodology and the population forecast provided by the Planning Department from the 2000 Census, the computer planning model has determined the following new ambulance facilities are needed at the specified locations. The ambulances required at each facility have been determined from an agreed reassignment of adjacent PVS zones to the new or reprovisioned facility.

Additional Ambulance Facilities Needed by 2006 and 2011					
Region	Area	Provided by	Ambulances on-run while commissioning		Remarks
			Day Shift	Night Shift	
H	Aberdeen	2006	6	3	To replace existing facility at firestation
	Chai Wan	2006	6	3	To replace existing facility
	Sheung Wan	2006	4	2	To replace existing facility at firestation
K	Kowloon Tong	2006	4	2	New provision
	Wong Tai Sin (2nd Depot)	2006	4	2	New provision
	Shun Lee	2006	6	3	To replace existing facility at firestation
	Kwun Tong	2006	8	4	New provision
	Lai Chi Kok	2006	4	2	New provision
	Mong Kok	2006	10	5	To replace existing facility at firestation

Additional Ambulance Facilities Needed by 2006 and 2011					
	Tseung Kwan O (3rd Depot)	2006	4	2	New provision
NT	Kwai Chung	2006	8	4	To replace existing facility at firestation
	Pak Shek Kok	2006	4	2	New provision
	Sheung Shui	2006	8	4	To replace existing facility at firestation
H	Tung Lo Wan	2011	4	2	To replace existing facility at firestation
NT	Fanling (2nd Depot)	2011	6	3	New provision
	Hung Shui Kiu	2011	4	2	New provision

Attachment 6 – A Sample Structured Call Taking Dialogue

1 Console Operator asks: " Where is your emergency? " "What is the address and what floor is the patient on? Is the patient inside or outside?"

Caller Response: Should provide address and location of patient

If caller hangs up phone now, you still have an address to send assistance

2 Console Operator asks: "What is the phone number you are calling from?"

Caller Response: Caller should respond with phone number

If caller is disconnected, the Console Operator can call back.

3 Console Operator asks: What is your name?

Caller Response: Caller should provide name

In some instances, such as when looking for a patient in a public place, if the ambulance cannot find the patient, it may be useful to call back the phone number provided and ask for the person who called. They may be able to direct the ambulance to the patient.

4 Console Operator asks: "Is the patient conscious? " or "Can the person talk?"

Caller Response: Should be either yes or no

5 *Caller Response: If Yes*

A Console Operator asks: "How old is the patient?"

Caller Response: Should respond with age or approximate age

B Console Operator asks: "Is it a male or female?"

Caller Response: Caller should respond with what sex the patient is

C Console Operator asks: "What is the person complaining of?"

Caller Response: Caller should state patients complaint; short of breath, chest pain, injury, headache etc.

D Console Operator asks: "Is the patient alert?"

A *Caller Response: "**YES" Go to # 2***

B *Caller Response: "**NO" IMMEDIATELY DISPATCH AMBULANCE***

Console Operator Response: "DO NOT HANG UP THE PHONE. I HAVE THE AMBULANCE ON ITS WAY" Go to Question # 7

6 *Caller Response: If NO*

A Console Operator: **DISPATCH AMBULANCE IMMEDIATELY**.

B Console Operator response to Caller: "**DO NOT HANG UP. I have sent the Ambulance to where you stated the patient needs help"**

7 Console Operator asks: Is the patient breathing normally?

A *Caller Response: "**NO**...Patient is not breathing"*

Console Operator Response: "Do you want to do CPR? I can help you?"

I *Caller Response: If **YES GO TO CPR***

Console Operator Response: "I will tell you what to do next" Console Operator should then consult directions for on performing CPR (See CPR Protocol)

II *Caller Response: If **NO***

Console Operator Response: **"DO NOT HANG UP THE PHONE HELP IS ON THE WAY"**

B *Caller Response: "**YES**, the patient is breathing"*

Console Operator asks: "Is the patient breathing normally?"

I *Caller Response: "**YES" Go to # C***

II *Caller Response: "**NO" IMMEDIATELY DISPATCH AMBULANCE***

Console Operator Response: "DO NOT HANG UP THE PHONE. I HAVE THE AMBULANCE ON ITS WAY" "I will tell you what to do next" GO TO QUESTION # 9

C Console Operator asks: "Is this the first time the patient has been unconscious today?"

I *Caller Response: "**YES" Go to # D***

II *Caller Response: "**NO" IMMEDIATELY DISPATCH AMBULANCE***

Console Operator Response: "DO NOT HANG UP THE PHONE. I HAVE THE AMBULANCE ON ITS WAY" Go to Question # 9

D Console Operator asks: "Have you or anyone else tried to wake the patient up?"

I *Caller Response: "**NO" Go to # E***

II *Caller Response: "**YES"IMMEDIATELY DISPATCH AMBULANCE***

Console Operator Response: "DO NOT HANG UP THE PHONE. I HAVE THE AMBULANCE ON ITS WAY" Go to Question # 9

E Console Operator asks: "Has the patient taken any medication or recreational drugs with alcohol?"

I *Caller Response: "**NO" Go to # F***

II *Caller Response: "**YES"**IMMEDIATELY DISPATCH AMBULANCE*

Console Operator Response: "DO NOT HANG UP THE PHONE. I HAVE THE AMBULANCE ON ITS WAY" Go to Question # 9

F Console Operator asks: "What was the patient doing before they became unconscious?"

I *Caller Response: "**NOTHING" Go to # G***

II *Caller Response: If Caller states any of the following: Patient was struck on head with an object or vehicle or fell on head **IMMEDIATELY DISPATCH AMBULANCE***

Console Operator Response: “DO NOT HANG UP THE PHONE. I HAVE THE AMBULANCE ON ITS WAY” Go to Question # 9

G Console Operator asks: “Have you or anyone else tried to wake the patient up?”

I *Caller Response: “**NO**” **Go to # H***

II Caller Response: “**YES”IMMEDIATELY DISPATCH AMBULANCE**

Console Operator Response: “DO NOT HANG UP THE PHONE. I HAVE THE AMBULANCE ON ITS WAY” Go to Question # 9

H Console Operator asks: “Did the patient have any complaints before they became unconscious?”

I *Caller Response: “**NO**” **Go to # I***

II *Caller Response: “**YES**”*

a Console Operator asks: “What were they?”

*Caller Response: Caller states one or all of the following: Chest pain/discomfort/palpitations, shortness of breath/respiratory distress, dizziness, fainting while sitting or standing, nausea/vomiting, bleeding, abdominal pain, **IMMEDIATELY DISPATCH AMBULANCE***

Console Operator Response: “DO NOT HANG UP THE PHONE. I HAVE THE AMBULANCE ON ITS WAY” Go to Question # 9

I Console Operator asks: “Has the patient taken any medication or recreational drugs with alcohol?”

I *Caller Response: “**NO**” **Go to # J***

II *Caller Response: “**YES”**IMMEDIATELY DISPATCH AMBULANCE*

Console Operator Response: “DO NOT HANG UP THE PHONE. I HAVE THE AMBULANCE ON ITS WAY” Go to Question # 9

J Console Operator asks: "What was the patient doing before they became unconscious?"

I *Caller Response: "**NOTHING" Go to # K***

II *Caller Response: If Caller states any of the following: Patient was struck on head with an object or vehicle or fell on head **IMMEDIATELY DISPATCH AMBULANCE***

Console Operator Response: "DO NOT HANG UP THE PHONE. I HAVE THE AMBULANCE ON ITS WAY" Go to Question # 9

K Console Operator asks: "Did the patient have any complaints before they became unconscious?"

I *Caller Response: "**NO" Go to # L***

II *Caller Response: "**YES"***

a Console Operator asks: "What were they?"

Caller Response: Caller states one or all of the following: Chest pain/discomfort/palpitations, shortness of breath/respiratory distress, dizziness, fainting while sitting or standing, nausea/vomiting, bleeding, abdominal pain, **IMMEDIATELY DISPATCH AMBULANCE**

Console Operator Response: "DO NOT HANG UP THE PHONE. I HAVE THE AMBULANCE ON ITS WAY" Go to Question # 9

L Console Operator asks: "Does the patient have a medic alert tag?

I *Caller Response: "**NO" Go to # 9***

II *Caller Response: "**YES"***

a Console Operator asks: "What does it say?"

*Caller Response: Any of the following: Diabetes, heart condition, epilepsy, stroke, COPD, asthma, congestive heart failure, recent surgery, pulmonary embolism, **IMMEDIATELY DISPATCH AMBULANCE***

Console Operator Response: "DO NOT HANG UP THE PHONE. I HAVE THE AMBULANCE ON ITS WAY" Go to Question # 9

8 *Caller Response: "I do not know" or "I am uncertain" or "I cannot tell"*

Console Operator Response: "**DO NOT HANG UP THE PHONE**. Go and see if the chest rises and falls and come back to the phone and then tell me"

9 Console Operator Directions: Advise the Caller to do the following:

A "Have patient lie down"

B "If patient is vomiting, lay patient on side"

C "Do not leave patient"

D "Be prepared to do CPR"

E "Gather patients medications, if possible"

F "If the patient's condition changes, call me back"

G "Be ready to show the ambulance team where the patient is"

Attachment 7 – FSACTS Schedule of Accommodation in 3 years

		Required (based on yr 2006) No.	Existing No.	New (additional) No.	Size (m^2)	Total (m^2)
(A)	**Offices**					
	- Medical Director	3	1	2	10	20
	- Commandant	1	1	-		
	- Deputy Commandant	1	1	-		
	- Superintendent (QA)	1	0	1	8	8
	- SAO	5	2	3	7	21
(B)	**Open-plan Offices**					
	- Instructors (AO) (15 nos.)	2	1	1	63	63
	- Assistant Instructors (15 nos.)	1	1			
	- Clerical Staff	1	1	-		
(C)	**Resources Centre**	1	1	-		
(D)	**Stores**	8	6	2	20	40
(E)	**Teaching Areas**					
	- Lecture Theatre	1	1	-		
	- Class Room	7	5	2	54	108
	- Simulation Room	21	4	17	20	340
	- Simulated A&E Room	1	1	-		
(F)	**Dormitory**					
	- Female Trainee	1	1	-		
	- Ambulance officer Recruit	1	1	-		
	- Ambulanceman Recruit	4	4	-		
(G)	**Canteen**	3	3	-		
(H)	**Recreation Room**	1	1	-		
(I)	**Standby Quarters for Assistant Instructors**	1	1	-		
(J)	**Gymnasium**	1	1	-		
(K)	**Toilet**					
	- Male	5	3	2	20	40
	- Female	5	3	2	15	30
(L)	**Circulation / Corridor**			Assumed 30%: 182		
						Total: 852 m^2

Attachment 8 - Estimated Training Facilities and Staff Resources Requirement

1) **Paramedic Training**

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Average number of annual training commitment (man-week)	2583	2702	2820	2187	2341	2778	2859	2859	2859	2859	2859	2859	2859
Classroom required = training commitment / 24 / 48 (weeks)*	3	3	3	2	3	3	3	3	3	3	3	3	3
Simulation Room required = no. of classroom x 4.2 i.e. 6 x 70% (because 70% of the training will be conducted in simulation room)	13	13	13	9	13	13	13	13	13	13	13	13	13
Average Training officers required for each course	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Estimated number of training staff required = training commitment x 4.5 / 24 / 48 (weeks)*	**11**	**11**	**12**	**9**	**10**	**11**	**12**	**12**	**12**	**12**	**12**	**12**	**12**

* Excluding public holidays and time for preparation of intake, the active training week of FSACTS is 48. The class size of each course is assumed to be 24.

2) **Non-Paramedic Training**

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Average number of annual training commitment (man-week)	4119	3674	3290	3652	3662	2454	2714	2714	2774	2454	2714	2774	2454
Classroom required = training commitment / 24 / 48 (weeks)*	4	4	3	4	4	3	3	3	3	3	3	3	3
Simulation Room required = no. of classroom x 1.8 (because 30% of the training will be conducted in simulation room i.e. 6 x 30%)	8	8	6	8	8	6	6	6	6	6	6	6	6
Average Training officers required for each course	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Estimated number of training staff required = training commitment x 2.5 / 24 / 48 (weeks)*	**9**	**8**	**8**	**8**	**8**	**6**	**6**	**6**	**7**	**6**	**6**	**7**	**6**

* Excluding public holidays and time for preparation of intake, the active training week of FSACTS is 48. The class size of each course is assumed to be 24.

3) **Summary**

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Classroom required	**7**	**7**	**6**	**6**	**7**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**
Simulation Room required	**21**	**21**	**19**	**17**	**21**	**19**	**19**	**19**	**19**	**19**	**19**	**19**	**19**
AO responsible for administration of FSACTS	1	1	1	1	1	1	1	1	1	1	1	1	1
Training Officer at AO rank required	17	16	18	14	15	15	15	15	16	16	15	16	16
Training Officer at SAO rank required	3	3	2	3	3	2	3	3	3	2	3	3	2
Total number of Officers required	**21**	**20**	**21**	**18**	**19**	**18**	**19**	**19**	**20**	**19**	**19**	**20**	**19**

Projection of Paramedic Training Commitment

Major Paramedic Training Course	Class size		Year												
			2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
2-week EMA II Workshop	8	man weeks	384	384	384	144	144	144	144	144	144	144	144	144	144
		courses	24	24	24	9	9	9	9	9	9	9	9	9	9
6-week EMA II Course	24	man weeks	1152	1152	1152	432	432	432	432	432	432	432	432	432	432
		courses	8	8	8	3	3	3	3	3	3	3	3	3	3
2-week Hospital Attachment	8	man weeks	384	384	384	144	144	144	144	144	144	144	144	144	144
		courses	24	24	24	9	9	9	9	9	9	9	9	9	9
2-week EMA II Re-certification (every 3 years for each EMA II)	12	man weeks	216	216	216	600	600	600	600	600	600	600	600	600	600
		courses	9	9	9	25	25	25	25	25	25	25	25	25	25
2-week EMA I programme (for ambulance aid personnel)	12	man weeks	240	240	240	240	240	0	0	0	0	0	0	0	0
		courses	10	10	10	10	10	0	0	0	0	0	0	0	0
2-day EMA I update course (every year for each EMA I)	12	man weeks	0	0	0	0	0	523	523	523	523	523	523	523	523
		courses	0	0	0	0	0	109	109	109	109	109	109	109	109
Continuing Medical Education (4 days every 3 years for each EMA II)	24	man weeks	90	141	192	243	243	243	243	243	243	243	243	243	243
		courses	14	22	30	38	38	38	38	38	38	38	38	38	38
3-day Advanced Airway Management course	12	man weeks	50	50	50	115	115	115	43	43	43	43	43	43	43
		courses	7	7	7	16	16	16	6	6	6	6	6	6	6
Advanced Airway Management Reassessment (4 days each year i.e. 1 day every quarter)	12	man weeks	67	134	202	269	422	576	730	730	730	730	730	730	730
		courses	7	14	21	28	44	60	76	76	76	76	76	76	76
Total Training commitment	**-**	**man weeks**	**2583**	**2702**	**2820**	**2187**	**2341**	**2778**	**2859**	**2859**	**2859**	**2859**	**2859**	**2859**	**2859**
No. of courses to be held	**-**	**courses**	**103**	**118**	**133**	**138**	**154**	**269**	**275**	**275**	**275**	**275**	**275**	**275**	**275**
Training Facilities required	Class Room		3	3	3	2	3	3	3	3	3	3	3	3	3
	Simulation Room		13	13	13	9	13	13	13	13	13	13	13	13	13
Training Manpower required	SAO		1	1	1	1	1	1	1	1	1	1	1	1	1
	AO		10	10	11	8	9	10	11	11	11	11	11	11	11

Projection of Paramedic Training Commitment

Supplementary Notes:

1. At present, number of officers (SAO + AO) with EMA II qualification are 71 and number of NCO with EMA II qualification are 264

2. No. of EMA II Workshop = no. of Hospital Attachment = no. of EMA II courses x 3

3. To train up all ambulance supervisors as EMA II by 2004, 8 EMA II courses are required. From 2005 onward, 3 courses will be required to fill the natural wastage of NCOs.

4. No. of EMA Re-certification Course required each year

   (i) 2002 to 2004 = 335 (264 NCO + 71 Officers) ÷ 3 years ÷ 12 = 9.3 courses (SAY 9)
   (ii) 2005 to 2007 = (335 + 576 (EMA qualified from 2002 to 2004)) ÷ 3 years ÷ 12 = 25.3 courses (SAY 25)

5. To uplift the skill level of all non-EMA II personnel to EMA I level by 2006, 604 ambulance personnel (2144 - 700 current EMA I - 192 x 3 to be trained as EMA II - 264 existing EMA II) should be given EMA I training in the coming 5 years.

6. To update the skill and knowledge of all EMA I ambulance personnel i.e. 1304 (2144 - 264 - 192 x 3), 2 days refresher course should be given to them every year.

7. Advanced Airway Management Course (for EMA with at least 3 years' experience

   (i) No. of EMA attended at present = 80 (20 Officers & 60 NCO)
   (ii) From 2002 to 2004 = (335 - 80) ÷ 3 ÷ 12 = 7.1 courses (SAY 7)
   (iii) From 2005 onward = No. of EMA II course 3 years ago x 24 ÷ 12

8. Advanced Airway Management Reassessment (4 separate days each year)
   (i) For 2002 = 80 ÷ 12 = 6.7 courses (SAY 7)
   (ii) From 2003 onward = No.of this course + no. of Advance Airway Management Course being held in the preceding year till 76 courses (911 ÷ 12 = 75.9 (SAY 76))

9. The estimated fleet expansion of about 3% per annum deduced from ORH consultancy report in 1995 is excluded from the above projection.

Projection of Non-paramedic Training Commitment

Major Non-paramedic Courses	Class size		Year 2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1/2-day AED Recertification (every 3 years for each qualified operator)	12	man weeks	888	888	888	888	888	0	0	0	0	0	0	0	0
		courses	37	37	37	37	37		Incorporated in 2-day EMA I update course in 2007						
24-week Recruit Ambulanceman Training	24	man weeks	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304
		courses	4	4	4	4	4	4	4	4	4	4	4	4	4
26-week Recruit AO Training	10	man weeks	520	260	0	260	260	0	260	260	260	0	260	260	0
		courses	2	1	0	1	1	0	1	1	1	0	1	1	0
2-week NCO Command Course	15	man weeks	0	0	0	150	150	150	150	150	150	150	150	150	150
		courses	0	0	0	5	5	5	5	5	5	5	5	5	5
2-week Ambulance Aid Refresher Course	16	man weeks	0	0	0	0	0	0	0	0	0	0	0	0	0
		courses	Converted to 2-week EMA I course in 2002												
2-day Refresher Course (for each ambulance aid personnel)	12	man weeks	347	222	98	50	0	0	0	0	0	0	0	0	0
		courses	72	46	20	10	No such course after all ambulance personnel are upgraded to EMA I level								
4-week Instructor Course	15	man weeks	60	0	0	0	60	0	0	0	60	0	0	60	0
		courses	1	0	0	0	1	0	0	0	1	0	0	1	0
Total Training commitment	**-**	**man weeks**	**4119**	**3674**	**3290**	**3652**	**3662**	**2454**	**2714**	**2714**	**2774**	**2454**	**2714**	**2774**	**2454**
No. of courses to be held	**-**	**courses**	**116**	**88**	**61**	**57**	**48**	**9**	**10**	**10**	**11**	**9**	**10**	**11**	**9**
Training Facilities required	Class Room		4	4	3	4	4	3	3	3	3	3	3	3	3
	Simulation Room		8	8	6	8	8	6	6	6	6	6	6	6	6
Training Manpower required	SAO		2	2	1	2	2	1	2	2	2	1	2	2	1
	AO		7	6	7	6	6	5	4	4	5	5	4	5	5

Projection of Non-paramedic Training Commitment

Supplementary Notes:

1. AED re-certification population = 1329 (2144 - 264 - 192 x 3 + 25). The number of courses required each year = 1329 ÷ 12 ÷ 3 = 37

2. Recruit Ambm Training population in 2002 - 2004 = 164 (additional 27 ambulance shifts) + 40 (advanced recruitment for full PAS implementation) + 88 (natural wastage of NCOs & Ambm)

3. From 2005 onward, 4 courses will be required to fill the natural wastage of NCO and Ambm

4. NCO Command course training population = NCO wastage, i.e. 80% of natural wastage

5. 2-day Refresher Course population = No. of personnel at ambulance aid level - No. of personnel at EMA I or EMA II level e.g. For 2002: 2144 - 264 (existing EMA II) - 700 (EMA I) - 192 (to be trained as EMA II) - 120 (to be trained as EMA I) = 868 = 72 courses.

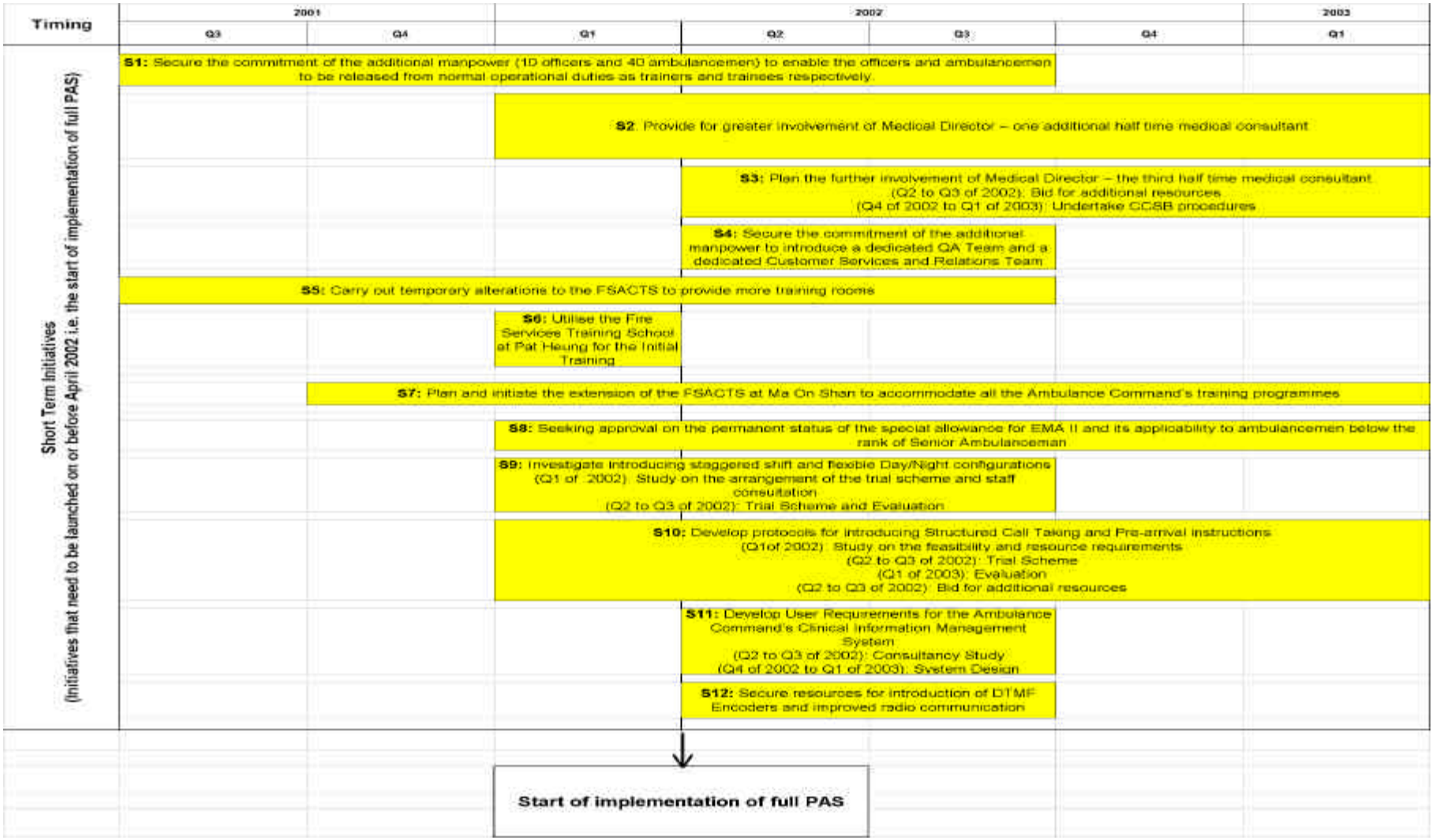
6. Other training commitments (such as Basic Amb Aid Course for Recruit Fire Personnel, AAMC Refresher Training, Community CPR training, ect.) that most likely remain unchanged throughout the period are excluded from the projection.

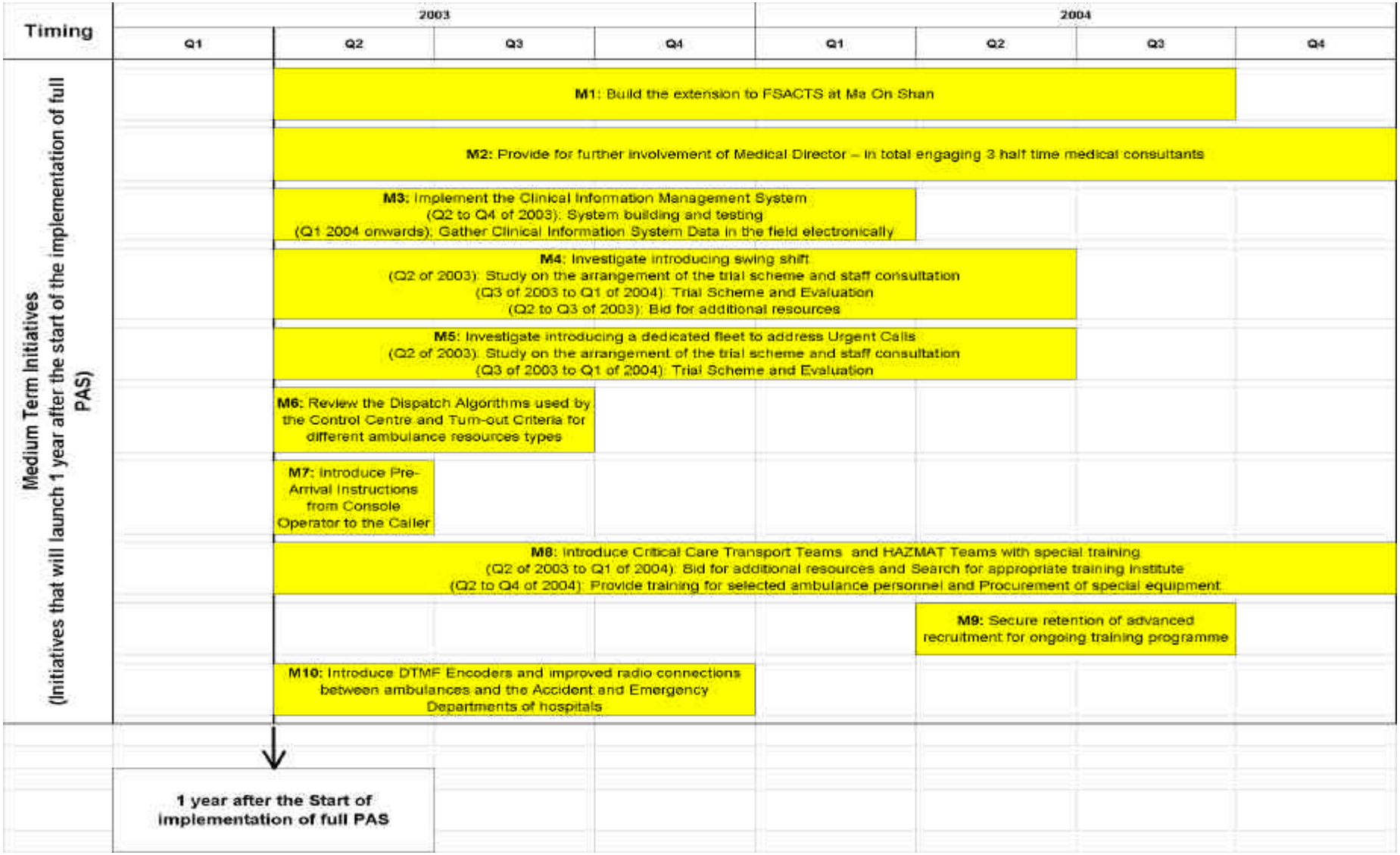
*Simulation exercises occupy 70% and 30% of the paramedic and non-paramedic training sessions respectively. Each simulation exercise will involve 6 instuctors. Based on this fact, paramedic training entails nearly double (1.8) instructors strength while compared with that of non-paramedic training. In this connection, the commitment of paramedic training have been counted double while calculating the overall training commitment.

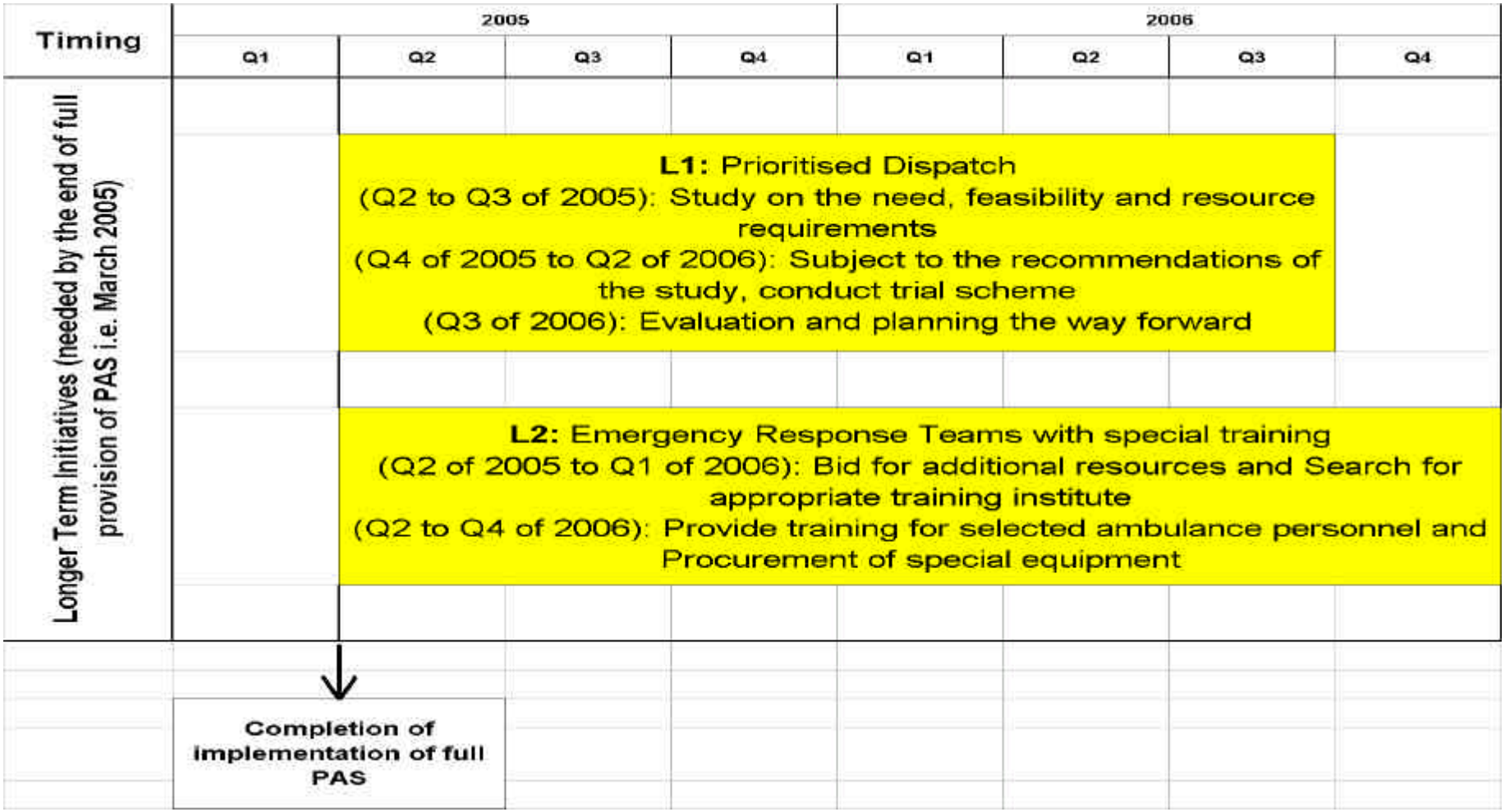
Attachment 9 – Summary of Proposed EMA II – Skills and Medication

	Skill	*Medication*
EMA I (Current)	Automatic External Defibrillator; Basic Life Support; Oropharyngeal Airway; Spinal Immobilization; Splinting/Bandaging; General Patient Care; Oxygen/Airway Adjuncts.	Entonox; Oxygen
EMA II (Current)	All skills for the EMA I; Comprehensive Patient Exam; Modified Airway (LMA); Drug Administration via: - IV/IM Injections; - SL Medications; Pulse Oximetry.	All Medications for EMA I; Dextrose 10%; Glucagon; Narcan; Nitroglycerin; Normal Saline; Thiamine; Ventolin.
Proposed EMA II	All Skills for the EMA I & II; Detailed patient exam; Advanced Airway to include: - Endo/naso-tracheal Intubation; - Surgical Airways; - Rapid Sequence Intubation; IO (Intra-osseous) Injections; Endo-tracheal Medication; External Jugular IV; 12 Lead EKG; Cardiac Pacing; Pneumatic Anti-shock Garment; Needle; Thoracocentesis.	All Medications for EMA I & II Activated Charcoal; Adenosine; Albuterol; Amiodarone; Aspirin; Atropine; Bumetanide; Calcium Chloride; D_5W; Dextrose 50%; Diltiazim; Diphenhydramine; Dopamine; Epinephrine; Flumazenil; Furosemide; Lidocaine; Magnesium Sulfate; Methylprednisolone; Morephine; Normal Saline; Pronestyl; Ringers Lactate; Sodium Bicarbonate; Thrombolytics; Valium; Vasopressin.

Attachment 10 – Implementation Plan




Timing
2003
2004
Q1
Q2
Q3
Q4
Q1
Q2
Q3
Q4
Medium Term Initiatives
(Initiatives that will launch 1 year after the start of the implementation of full PAS)
M1: Build the extension to FSACTS at Ma On Shan
M2: Provide for further involvement of Medical Director – in total engaging 3 half time medical consultants
M3: Implement the Clinical Information Management System
(Q2 to Q4 of 2003): System building and testing
(Q1 2004 onwards): Gather Clinical Information System Data in the field electronically
M4: Investigate introducing swing shift
(Q2 of 2003): Study on the arrangement of the trial scheme and staff consultation
(Q3 of 2003 to Q1 of 2004): Trial Scheme and Evaluation
(Q2 to Q3 of 2003): Bid for additional resources
M5: Investigate introducing a dedicated fleet to address Urgent Calls
(Q2 of 2003): Study on the arrangement of the trial scheme and staff consultation
(Q3 of 2003 to Q1 of 2004): Trial Scheme and Evaluation
M6: Review the Dispatch Algorithms used by the Control Centre and Turn-out Criteria for different ambulance resources types
M7: Introduce Pre-Arrival Instructions from Console Operator to the Caller
M8: Introduce Critical Care Transport Teams and HAZMAT Teams with special training
(Q2 of 2003 to Q1 of 2004): Bid for additional resources and Search for appropriate training institute
(Q2 to Q4 of 2004): Provide training for selected ambulance personnel and Procurement of special equipment
M9: Secure retention of advanced recruitment for ongoing training programme
M10: Introduce DTMF Encoders and improved radio connections between ambulances and the Accident and Emergency Departments of hospitals
1 year after the Start of implementation of full PAS


Timing
2005
2006
Q1
Q2
Q3
Q4
Q1
Q2
Q3
Q4
Longer Term Initiatives (needed by the end of full provision of PAS i.e. March 2005)
L1: Prioritised Dispatch
(Q2 to Q3 of 2005): Study on the need, feasibility and resource requirements
(Q4 of 2005 to Q2 of 2006): Subject to the recommendations of the study, conduct trial scheme
(Q3 of 2006): Evaluation and planning the way forward
L2: Emergency Response Teams with special training
(Q2 of 2005 to Q1 of 2006): Bid for additional resources and Search for appropriate training institute
(Q2 to Q4 of 2006): Provide training for selected ambulance personnel and Procurement of special equipment
Completion of implementation of full PAS

Ongoing Organizational Improvements
Continue to review deployments at each depot to best match demand with calls
Further developing both the EMA I and the EMA II Training Programme
Increase CME contacts between the Medical Director and paramedics
In respect of the surging demand in calls, secure a substantial increase in manpower resources and other resources that are urgently needed
Gain Bureau's commitment to link provision of ambulance resources to ambulance calls
Plan and provide more Ambulance Depots
Maintain Recertification and Refresher Programmes

Attachment 11 – Financial Implications of Full Provision of EMA II Services in 3 years

Two Overlapping EMA II Programmes with the maximum of 40 Ambulancemen being trained at one time and vacancies of both instructors and trainees to be covered by the Advanced Recruitment of Officers and Ambulancemen

Training Commitment	**2001-02**	**2002-03**	**2003-04**	**2004-05**
No. of Ambulance Supervisors to be trained as EMA II		192	192	192
No. of EMA II Courses to be conducted		8	8	8
Annual Financial implications:				
		(M)	**(M)**	**(M)**
(A) Employment of Medical Director		2.64	3.96	3.96
-Number of Half-time Medical Director required		2	3	3
(B) For 8 EMA II courses each year (See Note)				
- Acting allowance for instructors & trainees		0.49	0.26	0.17
- DSOA for instructors & trainees		5.41	0.00	0.00
- Advanced Recruitment expenditure for 1 SAO & 9 AOs		1.78	3.91	4.10
- Advanced Recruitment expenditure for 40 Ambms		3.29	6.96	7.26
(C) Additional Special Allowance		1.49	4.47	6.38
- Total additional quota = 718 eligible* - 280 existing^ = 438 * 328 Amb shifts x 2 + 31 EMAMC shifts x 2 = 718 ^ 120 EMA Amb shifts x 2 + 20 EMAMC shifts x 2 = 280		192 quota half provision	192 quota full provision + 192 quota half provision	384 quota full provision + 54 quota half provision
(D) Additional Equipment @$9,500		0.63	0.63	0.11
- For 60 additional EMA ambulances and 6 additional EMA motorcycle in 2002-03				
- For 61 additional EMA ambulances and 5 additional EMA motorcycle in 2003-04				
- For 12 additional EMA ambulances in 2004-05				
(E) Additional Expenditure on Medical Supplies @$4,500		0.22	0.65	0.92
- For 96 additional EMA shifts in 2002-03				
- For 96 additional EMA shifts in 2003-04				
- For 27 additional EMA shifts in 2004-05				
(F) Course fees for JIBC & HA		0.73	0.73	0.73
- JIBC: CAD$4,380 x 8 courses = $178,704				
- 1CAD$ = 5.1 HK$				
- HA: HK$69,200 x 8 courses = $553,600				
(G) Cost of modification of the FSACTS	1		6	9
(H) Cost of Additional Training Equipment	0.4			
(I) Establishment of a Quality Assurance Team (1 Superintendent, 2 SAO and 2 Assistant Clerical Officer)		2.41	2.41	2.41
(J) Establishment of a Public Information, Education and Relation Team (1 Superintendent, 2 SAO and 2 Assistant Clerical Officer)		2.41	2.41	2.41
Total:	**1.4**	**21.50**	**32.39**	**37.45**
Grand Total			**92.74**	

Note: Please refer to detailed calculation

Remarks: Government will also be paying recruit's salaries (10 Officers and 40 Ambulancemen)

in the first 6 months of 2002-03 (Cost is $5.07M)

Detailed Calculation of Acting Allowance and DSOA for Full Provision of PAS

No. of EMA course each year = 8 (class size: 24)
No. of Workshop each year = 24 (class size: 8)
No. of Hospital Attachment group each year = 24 (group size: 8)

(A) Acting Allowance & DSOA for Additional Training Staff

- In each 6 weeks period, 1 SAO (Course coordinator) & 9 AOs (instructors) are required to cater for one Basic Course (6 weeks, class size: 24), 3 Workshops (2 weeks, class size: 8) and 3 Hospital Attachments groups (2 weeks, group size: 8).
- To fill the 10 officer posts, 10 AOs will be recruited and trained. The initial training for AO will last for 26 weeks. Before the 10 AOs become functional, acting appointment down to SAmbm and recalling of 10 off-duty Ambm will be required to maintain operational efficiency.
- To enable the release of the 40 trainees, 40 Ambm will be recruited and trained. The initial training for ambulanceman will last for 24 weeks. Before the 40 Ambm become functional, 40 off-duty Ambm will be recalled to maintain operational efficiency.

Rank	Monthly Acting Allowance*	Quantity	Acting period (Days)	Total Acting Allowance
Ag SAO	$1,595	1	182	$9,518
Ag AO	$2,380	10	182	$142,020
Ag PAmbm	$695	10	182	$41,472
Ag SAmbm	$570	10	182	$34,013
			Total:	**$227,023** (a)

** Difference of minimum point of acting rank and maximum point of substantive rank*

Rank	Mid-point Salary	Quantity	Working hours*	Total DSOA
Ambm	$16,165	10	1248	$1,152,795 (b)

** 48 hours x 26 weeks*

(B) Acting Allowance & DSOA for releasing 40 (24 + 8 +8) ambulance supervisors to attend EMA training

Rank	Monthly Acting Allowance*	Quantity	Acting period (Days)	Total Acting Allowance
Ag PAmbm	$695	10	42	$9,570 **(c)**
Ag SAmbm	$570	30	42	$23,548 (d)

** Difference of minimum point of acting rank and maximum point of substantive rank*

Rank	Mid-point Salary	Quantity	Working hours*	Total DSOA
Ambm	$16,165	40	288	$1,064,119 (e)

** 48 hours x 6 weeks*

Remarks: At present, there are 133 PAmbms and 377 SAmbms not qualified as EMA II. Assuming that all of them are trainable and the ratio of PAmbm to SAmbm in each course is 1:3, all of them will be trained as EMA II within 21 6-week periods. No acting allowance will be required after this period.

Total acting allowance required for 2002-3 = (a) + [(c) + (d)] x 8	$491,967
Total acting allowance required for 2003-04 = [(c) + (d)] x 8	$264,944
Total acting allowance required for 2004-05 = [(c) + (d)] x 5	$165,590

Total DSOA for releasing 10 officers from operational regions for 26 weeks = (b)	$1,152,795
Total DSOA for releasing 40 trainees from operational regions for 24 weeks = (e) x 4	$4,256,476
Total DSOA required before the 10 recruited officers and 40 recruited Ambm become functional:	**$5,409,271**

Detailed Calculation of Advanced Recruitment Expenditure for 10 Officers and 40 Ambulancemen

(A) Advanced Recruitment Expenditure for 1 SAO and 9 AOs

Year	Rank	Salary	*Quantity	No. of month	Amount
2002-03 (last 6 months)	SAO	$49,270	1	6	$295,620
2002-03 (last 6 months)	AO	$27,570	9	6	$1,488,780
2003-04	SAO	$50,980	1	12	$611,760
2003-04	AO	$30,585	9	12	$3,303,180
2004-05	SAO	$52,910	1	12	$634,920
2004-05	AO	$32,130	9	12	$3,470,040

* 10 AOs are recruited for release of 10 trainers

(B) Advanced Recruitment Expenditure for 40 Ambulancemen

Year	Rank	Salary	*Quantity	No. of month	Amount
2002-03 (last 6 months)	Ambm	$13,710	40	6	$3,290,400
2003-04	Ambm	$14,500	40	12	$6,960,000
2004-05	Ambm	$15,115	40	12	$7,255,200

* 40 ambulancemen are recruited for release of 40 trainees