

original Article

Aero medical experiences in Indian Peace Keeping Missions under United Nations in Sierra Leone (UNAMSIL) and Democratic Republic of Congo (MONUC)

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ABSTRACT

Indian Air Force helicopter contingents participated in the United Nations peace keeping missions in Sierra Leone (UNAMSIL) in the year 2000 and in Congo (MONUC) from 2003 till date. The paper discusses various aero medical experiences in the year 2000 in UN AMSIL and June 2003 to Aug 2005 in MONUC. The difficult aviation environment in the mission areas and the resultant immense aero medical challenges are discussed. The data of high aircrew fitness rates despite the difficult conditions is discussed. Large numbers of causality evacuations were carried out where the contingent's medical personnel provided the in-flight medical cover. The details of the causality evacuations data are discussed. In the three years under consideration, there was one human error accident and four major incidents attributable to technical reasons or battlefield damage and the paper discusses these in brief. The paper also discusses the dilemma of Malaria prophylaxis in aircrew deployed for prolonged periods in highly endemic and drug resistant areas. The reported side effects of Mefloquine, our Mefloquine administration strategies and precautions adopted are discussed. The observed side effects are elaborated and attempt is made to explain the variance of our experiences with Mefloquine vis-a-vis those reported in the Western literature.

IJASM 2007; 51(1): 32-37

Keywords: UN Missions, Mefloquine, aircrew

Indian Air Force (IAF) has been contributing air power to the United Nations peace keeping missions since the 1950's. Its Canberra aircraft played a role in the peace mission in Democratic Republic of Congo in mid 1950's and its Chetak helicopters were well embedded with the Indian Army's peacekeeping contingent in Somalia in the early 1990's.

Since 2000, the IAF has launched its own large and self-sustaining independent peace keeping contingents, first to the United Nations peace missions in Sierra Leone (UNAMSIL) and then to the Democratic Republic of Congo (MONUC) These IAF missions were helicopter based and were assigned varied roles to support the entire mission activities.

Operating conditions, flight safety and aero medical challenges

As is typical to any peace keeping mission area, the operating conditions in these missions were difficult from flight safety point of view. Within the mission area, the aircraft operated over large terrains that were relatively unknown to the aircrew, often not under UN control and swamped by rebel warring troops. The available maps were often not updated and the helipad information required to be specially

clarified prior to missions. The helipads were also often under prepared and take-offs / landings at makeshift sites was a rule rather than

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Manuscript received: 14-01-07

Accepted for publication: 04-05-07

exception. Thick tropical forests made this task even more difficult. Tropical weather with frequent thunderstorms and treetop level clouds further complicated the flying conditions. The mission areas often had multilingual aircraft operators from different countries. The ATC controllers at major airfields and battalion RT operators guiding the helicopters at remote landing sites had peculiar phonetics. These made RT comprehension and communication a task in itself. It was important to constantly educate and brief the aircrew to maintain situational awareness and reiterate the need to tackle spatial disorientation in the disorientation-prone operating conditions.

The residential conditions in the mission area were far from ideal. In Sierra Leone the crew stayed in standard, open, non-air conditioned field tents, whereas in Congo after the first 6 months of the initial deployment, the conditions were slightly better in pre-fabricated fiberglass air conditioned cubicles. The mission areas teemed with a variety of insects and reptiles. These conditions could potentially have effect on crew rest and mission efficacy. The mission areas also had high prevalence of communicable diseases, some of which like Lassa fever, Yellow fever etc were alien to the Indian subcontinent. Drug resistant Malaria was also highly prevalent. Protection of the aircrew from Malaria and other infectious diseases was an important task and the aero medical issues specifically related to chemical prophylaxis are discussed later. The aircrews were exposed to distant and remote lands during their sorties and to patients with communicable diseases during CASEVAC / MEDEVAC. There was a high potential of rapid disease transmission by the aerial route and of aircrew suffering from the diseases themselves.

Another difficult issue was limited logistics; especially availability of specific aircraft spares parts. The self-contained contingent had catered for most of the needed spares but procurement of any spares from mission area was impossible and from

India was highly time consuming. The aircraft maintenance crew had to use some exemplary skills to keep the aircraft serviceable and operating safely despite these logistic constraints, dusty, hot or rainy environment and open air servicing conditions.

Last but not the least; the doctors were specifically tasked by contingent commanders to help in maintaining mental well being, morale and motivation of the aircrew. The archetypal role of the aviation medicine specialist as a friend, philosopher and guide of aircrew was truly exemplified in these alien-operating conditions.

From the difficult operating conditions emanated the aero-medical challenges to ensure that the mission and task of the contingents was met without any health-related hindrances. The primary challenge was to maintain high fitness levels in aircrew to ensure operational preparedness. This included illness management in terms of early disease detection and treatment as well as wellness management in terms of primary disease prevention, hygiene and sanitation. The fitness rate was calculated as:

$$\frac{[\text{Number of aircrew} \times \text{Total days in month}] - \text{Unfit days due to illness}}{100 \times \text{Number of aircrew} \times \text{Total days in month}} \times 100$$

The average fitness rates were 96.6% (Range -90.9% to 100%), which were very satisfactory. There were expected dips in the fitness immediately on induction (90.9%) and in September due to post rainy season tropical diseases (94.8%) [1].

CASEVAC / MEDEVAC [1]

In Sierra Leone the contingent was the primary agency to conduct CASEVAC MEDEVAC from the battle zones and troop

locations through out the mission area. This humanitarian relief effort often included picking up casualties from extremely hazardous areas. More than 150 casualties were evacuated by the contingent. The medical component of the IAF contingent was tasked to provide in flight medical cover (doctor or paramedic) to all serious patients being transported by the contingent in the entire mission area. For this purpose, two special CASEVAC kits were devised, one for medical assistant and one for Medical Officer. A total of 30 CASEVAC sorties (43 patients) were provided in-flight cover, which also included 15 battle casualties picked up directly from the battlefield.

In MONUC, the aircraft were tasked for CASEVAC / MEDEVAC from the field till the nearest Level II Medical Facility or till the nearest runway where a dedicated Aero Medical Evacuation Team (AMET) with fixed wing aircraft would take them to the Level III facility (1800km away).

Flying incidents and accidents

The major accidents / incidents that occurred in the three years under consideration in this paper are briefly discussed below:-

(a) Mi-8 Main Gear Box (MGB) Failure. A Mi-

8 helicopters were on troop-transportation mission from a field helipad in UNAMSIL. After take off and 10 Km outbound travel the MGB low oil pressure light came on with severe grinding noises from MGB. The aircraft returned to take off helipad. Technical investigations revealed metal scrapings and chips in the MGB lubricating oil. The investigations were completed as a case of 'technical defect' with potentially serious implications.

(b) Mi-8 Emergency Force Landing. A Mi-8

helicopter was on inbound Logistic, outbound troop transport' mission into rebel stronghold to provide supplies to UN peacekeepers and to extricate military observers and sick troops. On landing, as

the supplies were partly off loaded, sudden unprovoked firing started from the rebel side, and the passengers forcefully entered the helicopter and overloaded it. The captain initiated emergency take off. The helicopter experienced extreme and severe vibrations and became uncontrollable in air. The helicopter was force landed about 10 miles outbound, once out of firing range, and a 'May Day' call was given, that was picked up and acted upon by another contingent Mi-8 helicopter in the vicinity. The helicopter was rescued after more than 6 months once the peace situation improved. Investigations revealed that the main rotor blades had got severely damaged due to bullets and had caused the extreme vibrations in flight. The incident was labeled as 'damage due to enemy action' with very serious implications. The human effort of the crew of the severely disabled aircraft in preventing fatalities and that of the rescuing aircraft for its immediate SAR response were highly applauded.

(c) Mi-25 Crash landing. A Mi-25 gunship was carrying out troop transportation mission. On take off from a distant helipad that was at an elevation, the gross weight exceeded that permissible, as the aircraft transitioned from IGE to OGE the engine got overloaded and the engine rpm started dropping. The crew did not correct this in time and the helicopter descended rapidly and crash landed in a nearby depression. All occupants of the helicopter managed to successfully evacuate themselves. The helicopter was repaired and recovered later. Investigations revealed that the crew had failed to correct for the elevation of the distant helipad (that was as at higher altitude than base helipad) and carried more than permitted weight in OGE configuration for that helipad. Hence the helicopter sank and crash-landed. It was labeled as a case of

human error accident.

- (d) **Mi-25 battle damage.** On a routine sortie a Mi-25 gunship came under MMG fire from rebel troops on ground. The fuel tanks, electrical systems and controls were damaged. The helicopter safely landed back at home base and was subsequently repaired. It was labeled as a case of battle damage.
- (e) **Mi-17 Hydraulic failure.** A Mi-17 helicopter experienced main and standby hydraulic failure after take off. The mission was abandoned and helicopter safely landed back at base helipad. The case was labeled as technical defect.

Mefloquine Prophylaxis for Malaria in Aircrew

Multi-drug resistant Falciparum Malaria was reported to be rampant in both the mission areas. Apart from other means of Malaria prevention like personal protection measures (mosquito repellants, insecticide treated bed nets, mosquito proofing of accommodation, etc), the UN had recommended a weekly one-tablet dose of Mefloquine (250 mg) as Malaria prophylaxis for all peacekeepers, including aircrew. Other recommended modalities of chemoprophylaxis in peacekeepers that could not take Mefloquine (e.g. known G6PD deficiency) were intake of 100 mg capsule Doxycycline daily or tablet Proguanil weekly.

Side effects of Mefloquine have been reported in the literature and their potential operational hindrance in military activities first came to the world's attention when reported by Canadian troops in Somalia [2]. Due to the above reported side effects, Mefloquine has been considered unsafe for malaria prophylaxis in aircrew [3].

In prophylactic dosages, the side effects are insignificant and lower than in curative therapy. Low incidence of gastrointestinal disturbances with nausea, vomiting (3%), diarrhea and abdominal pain are reported. Moreover, these side effects may decrease over a period of time despite continued consumption [4].

In curative dosages, dizziness, vertigo, syncope, extra systoles, headache, sleep disorders (insomnia, somnolence and abnormal dreams) are reported in less than 1% cases. Very rarely, significant neuro-psychiatric side effects such as anxiety, depression, mood changes, panic attacks, confusion, aggression, hallucinations, neuropathies and psychotic reactions are reported. Association of Mefloquine and suicide ideation has been suggested but not confirmed. Hypersensitivity to Mefloquine in form of skin manifestations such as rash, exanthema, urticaria, purities, erythematic multiform and Steven Johnson Syndrome are also reported in susceptible subjects [4].

The Indian peace keeping mission was hence faced with a dichotomy between UN recommendations for Malaria prevention and reported side effects of Mefloquine [1,5]. Avoiding use of Mefloquine would make the aircrew highly susceptible to Falciparum Malaria and its use may expose them to some side effects. Resistance to Doxycycline and Proguanil was reported to be high with consequent chances of breakthrough Malaria.

Moreover, daily Doxycycline for 350 -400 days also had the potential to induce neutropenia, thrombocytopenia and hemolytic anemia in addition to other hepatotoxic effects. This would need monitoring with weekly blood test for CBC in all aircrew, an idea with which the aircrew expressed discomfort.

Daily dosage of Doxycycline could potentially also lead to intake non-compliance over prolonged deployment period and consequential breakthrough Malaria. The aircrew also found this operationally unacceptable because of frequent outstation

deployments and possibilities of survival situation in case the aircrew had to abandon their aircraft

(weekly Mefloquine would protect them for at least a week). Hence both Doxycycline and Proguanil, though considered, were at best the second choice.

After intense discussions with UN authorities, IAF medical services and senior participating aircrew it was decided to introduce prophylactic Mefloquine in UNAMSIL. The same decision was pursued in MONUC, bolstered by our limited experience with Mefloquine in UNAMSIL at that time.

All aircrew were specially briefed about the side effects and asked to report any symptoms. Two weeks prior to deployment, weekly Mefloquine was started. On deployment, another 2-week period in which the helicopters were being re-assembled for operations, the aircrews were continued on weekly Mefloquine. During these 4 weeks an intense monitoring program to identify propensity to side effects in each individual aircrew was instituted.

During deployment period the strategy of 'crew pairing' was actively pursued. The aircrews were divided in two groups, each group taking Mefloquine on two different days (Tuesday and Wednesday). Within each of the groups, pilots were identified as those who were comfortable with taking Mefloquine in the morning and those comfortable in the evenings. Flight Commanders were briefed and they ensured, as far as possible, that they avoided detailing the group taking Mefloquine on a given day from flying duties for 24 hours after taking the Mefloquine dose on that day. In case this arrangement became unavoidable due to excessive flying commitment, care was taken to pair 'one on' and 'one off' pilot as crew for the flight. In addition, to minimize the short-term Gastro-intestinal effects of Mefloquine, alcohol and spicy non-vegetarian food was prohibited on the days of Mefloquine intake. Non-absorbable Antacids were given to those susceptible.

Our three years experience shows that indeed Mefloquine was well tolerated by the aircrew and side effects experienced were insignificant [1]. Gastrointestinal disturbances, mainly minimal nausea and Dyspepsia, were common on the day of the tablet intake. Vomiting / diarrhea were not reported. A few aircrews reported delayed sleep initiation but there were no reports of insomnia or nightmares. It is noteworthy that the alien residential conditions also contributed to delayed sleep initiation. There were no reports of anxiety, headache, dizziness / vertigo or libido disturbances in aircrew though some ground personnel did report 'feeling like having too much caffeine'. There were no other clinically serious side effects that were observed. There was one case of Erythema Multiform / Steven Johnson Syndrome that was attributed to Mefloquine.

Evidently, Mefloquine provided excellent prophylaxis against Malaria, as there was only 1 case of Falciparum Malaria in 3 years that occurred when an aircrew forgot and missed his dosage during live operations (drug non-compliance). We also found that overall Mefloquine had good compliance in weekly dosage schedule (vis-a-vis daily dosage of Doxycycline). Neither any of the flying incidence / accidents could be attributed to Mefloquine nor did the aircrew report any increased tendencies to get disorientated in about 11,580 hours of flying. Similar positive experiences have been reported in 2006 and 2007 from MONUC. (6)

It is possible that helicopter operations, with at least two pilots onboard, tended to mask any subtle cognitive deficits that may have developed in individual pilots. But perhaps that further substantiates the precautions and crew-pairing policies adopted by us.

The variance of Mefloquine side effects in

our experience with Mefloquine prophylaxis from that reported in the Western literature may be

a chance finding. But it could also be hypothesized to a racial bias in the spectrum and severity of the side effects. All the studies on the side effects of Mefloquine have been conducted on Caucasian / Negroid populations and there may be a degree of racial resistance to the side effects of Mefloquine amongst Indians /Asian populations. This hypothesis however needs to be proved with more field data and firm scientific research in the future.

Conclusions

Air operations during peace keeping missions are unique in that they may need innovative aero-medical adaptations to suit the alien, hostile conditions. The IAF contingents were able to achieve high aircrew fitness and consequent operational effectiveness. They were able to support the Missions' objectives and carry out good humanitarian effort, especially through MEDEVACS / CASEVACS. During the deployment periods of three years under consideration in this paper, the contingents had only one human error related flying accident. The cost -benefit analysis of our experience indicates that Mefloquine is safe for Malaria prevention in aircrew, especially in so far as helicopter operations are concerned.

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