AVIATION IN DISASTER RESPONSE OPERATIONS.

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Aviation assets have played an important role in response to major natural disasters for many years. Traditionally aviation support to disaster relief included airlift, SAR and ATM services. Nowadays, the scope of civilian and military aviation employment in disaster response increases. Air surveillance and reconnaissance as well as command and control capabilities are more and more common contribution to disaster response operations. The paper includes the discussion of lessons observed and development trends related to aviation support to disaster response operations.

K e y w o r d s: disasters, disaster response operations, aviation,

1 INTRODUCTION

Large scale natural disasters occurrence and severity have significantly increased in recent years. Consequently, international community, national governments and humanitarian organizations make substantial efforts to assist population affected by disasters. Aviation assets are employed regularly in disaster response operations. Traditionally, airlift, SAR and ATM services constituted a critical component of disaster response enabling timely assistance to affected population. The scope of aviation employment in disaster response increases. Air intelligence, surveillance and reconnaissance as well as command and control capabilities are more and more commonly employed during disaster response operations. Recent operations have seen also use of UAVs and precision airdrops in humanitarian roles.

As the lessons from aviation employment in disaster relief operations have been accumulating and some research on aviation's roles, capabilities and organization has been conducted in recent years, the aim of the paper is to summarize lessons observed and discuss development trends related to aviation employment in disaster response operations.

2 RESPONSE TO DISASTERS

The incidence of disasters around the world has significantly increased over last two decades. The most difficult disasters to respond have proved to be those ones occurring without or with little warning time (rapid-onset disasters) such as floods, earthquakes, windstorms, landslides, extreme temperatures, waves and surges or volcanic eruptions. Main reasons for the increase of the number of documented natural disasters in last twenty years have been raising frequency of hydrometeorological hazards (floods and windstorms). International databases documented around 200 to 300 natural disasters yearly in the world in the nineties and since 2000 the numbers of rapid onset natural disasters have fluctuated between 380 and 520. A significant part of disasters that have occurred since nineties were large scale disasters (according to the UN methodology – those ones that kill or affect between 10000 and 99999 people). It has been however quite common that large scale disasters affected millions of people in several countries and made disaster response operations more difficult.

Although national procedures for response to natural disasters may be different in different countries, the basic philosophy seems similar, including relatively universal tenets, phasing of activities and assets employment. The overall coordination of response to natural disasters remains responsibility of civilian authorities which may be supported by military if needed. Military assets are usually used when no civilian assets or capabilities are available or quick response time is critical. Depending on the scale of disaster, territory and population affected, the responsibility for response is vested to local, regional and national authorities. In case of large scale rapid-onset disasters, when a single nation is not able to respond, the government requests international disaster relief assistance (IRDA) to meet the needs of population affected by a disaster. Such assistance may be provided through international organisations and humanitarian organisations (including Non-Governmental Organisations – NGO) or bilaterally by specific states that decided to assist affected country. In most cases affected countries place the time limits

on foreign IRDA on its territory, usually 90 days.

Lessons observed during response to Indian Ocean tsunami of 2004, Pakistan earthquake in 2005 and more recently Haiti earthquake and flooding in Pakistan in 2010 allow making quite fair assessment on parties participating in future disaster response operations. When international disaster relief assistance is requested after a major natural disaster it will possibly trigger the involvement of key well developed countries with global interests, several countries from the region, major international organisations and their respective agencies as well as hundreds of humanitarian non-governmental and private voluntary organisations (PVO). Part of the response will be conducted by military, both of the affected country and foreign military assets sent as IRDA by other countries. The diversity and number of participants in response to large scale disasters makes an effective management of relief activities real challenge. As the affected country is not always capable to coordinate effectively actions of all rescue and relief actors this task may be delegated to an international organisation (like the UN) or a country that is capable and willing to do so.

Based on the degree of contact with the population affected by large scale natural disasters different types of assistance are distinguished: direct assistance, indirect assistance and infrastructure support. Direct assistance includes personal contact with affected population, face to face distribution of relief items and services. Typically, it is responsibility of civilians or national military. Indirect support includes activities one step away from affected population such as transport of relief items and personnel, while infrastructure support comprises of the provision of general services that facilitate response to natural disaster but are not solely for the benefit of affected population or visible to it.

Disaster response operations include normally several phases which depending on specific situation may vary in length and partly overlap. Typically, those phases include: predeployment preparations, immediate disaster relief, transition from relief to rehabilitation and finally transition from rehabilitation to development. Different objectives are to be accomplished in specific phases of response to large scale disasters and different types of support or assistance are needed throughout respective phases. The most critical phase of disaster response operation is immediate response relief, in which all available assets are employed primarily to save lives and alleviate suffering.

Response to large scale natural disasters requires safe environment that enables relief personnel to access affected population and provide it with direct assistance. It is the affected country responsibility to assure secure environment for IDRA personnel and ideally relief specialists should focus on saving lives and alleviating people's suffering. In practice however; it is quite often that the lack of security which results from internal conflicts or organised crime precludes effective emergency relief operations making human costs of natural disaster even higher. Such a situation reopened also discussions about the role of military in humanitarian and relief efforts. After decades long reluctance of humanitarian community to military infringements into humanitarian space some acknowledgments of military utility in impartial disaster relief and humanitarian assistance emerged. Humanitarian organisations voice also concerns over their personnel security during disaster response and consider a closer cooperation with military as one of possible ways of improving situation.

4 AVIATION IN DISASTER RESPONSE OPERATIONS

Aviation have traditionally played a critical role in disaster response efforts since the early years of twentieth century. Initially, they were used mainly for transport of relief supplies and personnel and search and rescue operations. Specialised aircraft were also employed in fire fighting. Due to limited availability of civilian airplanes military aircraft were employed systematically to support response to natural disasters. Although military participated in disaster response operations for a long time, such tasks were not considered essential untill the end of cold war and little formal doctrine was created to guide military actions in such activities.

The situation changed after cold war ended and military started to seek new roles in dramatically changed security environment.

Support to civilian authorities during disaster response operations became a part of military operations other than war (MOOTW) doctrine in the USA and crisis response operations doctrine in NATO. Improvements to employment of civilian and military assets in disaster response operations resulted from large scale disasters that occurred in first decade of twenty first century. The Indian Ocean tsunami in 2004, earthquake in Pakistan in 2005 and hurricane Katrina evidenced how devastating natural disasters might be and revealed numerous weaknesses of emergency preparedness required for effective response in such situations.

Nowadays, the tasks of aviation assets in disaster response include a broad spectrum of activities that directly and indirectly support disaster response efforts. Transport of humanitarian relief supplies and personnel remains a key contribution of aviation to disaster response. While airplanes are mainly used for the air transport of cargo and personnel to the area affected by natural disaster, further distribution of relief items and passenger transport within the area of operations is conducted mainly by helicopters.

Aviation contribution in the form of infrastructure support to disaster response operations is often not clearly visible to the public, but it is crucial to effectiveness of relief efforts. Providing airfield operations services such as cargo and passengers handling, airfield security and POL distribution enable disaster assistance items and personnel an entry gate to the area affected by disaster. The unimpeded flow of air traffic with relief and assuring safety of air operations over the affected area and neighbouring countries requires always ATM services. Quite often when a country hit by a disaster is not able to provide efficient ATM services they are offered as a part of IDRA.

Aviation assets are used more and more frequently for surveillance and reconnaissance in support to disaster response. When some warning time is available (in case of hydrometeorological hazards) airborne sensors are used for disaster indicators surveillance allowing better preparations for emergency relief activities. The most common use of air assets in surveillance and reconnaissance is tied to damage assessment and search for survivors. The capability of ISR airborne platforms to operate relatively freely over affected areas gives decision makers and rescue teams access to near real time data that helps in establishment of situational awareness and setting priorities for further actions. Airborne assets are usually the only effective means for use of optoelectronic sensors that gather data in adverse weather conditions and at night with accuracy that enables to find people thanks to their thermal signatures.

Search and rescue operations (SAR) remain important task of aviation assets in response to natural disasters. As the number of specialised SAR helicopters is limited this task is often performed by utility and cargo helicopters if needed. Similarly, airborne medical evacuation of people injured during disaster to hospitals is usually conducted not only by specialised MEDEVAC aircraft but by any available helicopters or airplanes.

To understand the complexity of air assets contribution to disaster response operations it should be noted that it goes far beyond employment of fixed and rotary wing transport or SAR. Airborne ISR, ATM modules, command and control elements, as well as airfield operations assets and services play critical role in assuring timely and effective response to large scale natural disasters.

Response to numerous natural disasters in the last decade has proved importance and added value of aviation assets for relief efforts. Aviation assets were among the first to arrive and safe human lives during emergency relief phase of response to 26 Dec 2004 tsunami on the Indian Ocean. In Indonesia alone, 9.0 Richter earthquake and resulting tsunami waves completely destroyed approximately 500 km coast up to 5 km inland. With bridges and roads in the Aceh province washed away or collapsed aviation and maritime assets were the only to reach affected areas. Humanitarian assistance from around the world was initially possible through the airports: Banda Aceh, Meulaboh and Medan, but it required additional helicopter air bridge to transport relief items and personnel directly to affected areas.

IDRA aviation contributions for Indonesia included air traffic controllers, 75 helicopters and 43 fixed wing aircraft. Ninety days of operations were sufficient to draft some lessons for air assets employment in disaster response operations. The scale of infrastructure destruction made initially

the air and maritime assets the only available means of transportation. Early deployment of fixed wing and helicopters allowed for air distribution of humanitarian aid, air transport of personnel and aero medical evacuation. Air assets ensured continuous air bridge between airports and affected areas that was crucial for the success of rescue efforts in early days after tsunami struck Aceh province. Several specific lessons related to factors influencing employment of air assets were identified. Availability of airport infrastructure and ATM services proved critical for relief efforts in early days of response. A challenge of effective civil-military coordination was discovered. The ineffective sharing of information between military and NGOs delayed in some cases the delivery of relief items to affected population. Response to Indian Ocean tsunami revealed the importance of delegation of authority to use air assets to decision makers responsible directly for relief efforts. An example of drawbacks resulting from tied national control over air assets sent to disaster response was Japanese C-130s. The requirement to get permission for every flight from Tokio caused delays in using this air transport asset. In opposite, Denmark decision of delegating control authority over its air assets to disaster response decision makers allowed their effective and flexible employment. Response to tsunami in Indonesia raised also the question of ATM services availability. As the nation was not able to provide effective ATM services over affected area, these services were offered as a part of IDRA by one of assisting countries.

The most visible importance of aviation assets in response to a large scale natural disaster in the last decade was an earthquake in Pakistan in October 2005. A shallow 7,6 Richter earthquake followed by 978 serious aftershocks during next three weeks affected 30000 square km of remote, rugged and mountainous areas. With almost 3,5 million people directly affected, some 2,3 million without adequate food and 2,4 million homeless at the beginning of winter, danger of second massive wave of death was real and urgency for help obvious. Helicopters were the only means to reach quickly affected population high in the mountains. Along with Pakistani 60 helicopters, airport ground services and air traffic services, IDRA consisted mainly of aviation assets. NATO activated air bridge to move relief supplies to Pakistan and several nations sent 69 helicopters to perform in theatre transport and MEDEVAC missions. Of note is French contribution of Abbottabad fuel farm. This forward deployed field POL installation extended the reach of helicopters and increased tempo of operations.

Thanks to operations in Pakistan several lessons have been learned for aviation assets employment in disaster response. High altitude capable helicopters proved crucial to disaster efforts, but it took some time to find such helicopters in sufficient numbers and nations were initially reluctant to offer this kind of assistance. Geographic conditions (size and elevation of affected area) demanded additional infrastructure support for aviation employment. Forward operating bases were established to extend helicopters reach. A clear division of tasks was used in aviation assets employment. Transport aircraft were used for delivery of relief supplies to Pakistan (tents, stoves, sleep bags, etc), while helicopters for delivery of food, medicines and medical personnel, SAR as well MEDEVAC missions. English as a common operational language and similar operating procedures for air operations enhanced effectiveness of relief efforts. However; Pakistani control of foreign aviation assets (especially strict security and safety measures) decreased effectiveness of aviation operations.

Some observations related to possible challenges related to employment of air assets in response to large scale natural disasters were result of hurricane Katrina that hit U.S. southern states and created humanitarian crisis in New Orleans, Louisiana. Although mainly U.S. aviation assets were used the lessons observed may be useful for disaster relief in large urban areas. More than 230 helicopters operating 24/7 were used primarily for search and rescue operations, air transport and law enforcement. Operating conditions enforced helicopter crews to fly missions inside the city using see and avoid tactics, techniques and procedures during day and night. Night vision capable aircraft allowed continuous operations. To bring relief supplies closer to affected area more than 167 strategic airlift missions were flown in first five days after hurricane hit New Orleans. International rescue assets played marginal role in

disaster response. However; as the international relief supplies were accepted NATO decided to establish air bridge and several flights with relief items were flown from Europe to the USA. Space and airborne ISR assets played critical role in damage assessment providing decision makers with relatively complex picture of the situation in the city. For the first time unmanned aerial vehicles (UAV) capabilities were used for disaster response offering long endurance surveillance of areas affected by hurricane.

Importance of aviation assets in response to large scale disasters was proved one more time after earthquake caused devastation in Haiti on 12 January 2010. The scale and severity of the earthquake combined with instable internal situation rendered the country fully dependant on IRDA. While 26 countries responded to Haitian requests for assistance, the USA became immediately within first 24 hours after earthquake the lead nation for relief efforts. The government of Haiti transferred temporary control of Port-au-Prince airport to the U.S. military that made it responsible for efficient flow of relief supplies to the city. In addition to making capital airport operational and providing badly needed airfield operations, U.S. aviation assets were used for transport of supplies within the country as well as for MEDEVAC missions. Precision airdrops of relief supplies were conducted by C-17. RQ-4 Global Hawk mission was flown immediately after earthquake to evaluate the extent of damage and provide imagery to assist in continuing relief efforts. The response to earthquake in Haiti saw extensive use of military assets and challenged humanitarian communities with unknown problems of disaster response in urban areas. It sparked also discussions on the need to re-evaluate role of military in disaster relief.

In July 2010, the monsoon rains caused heavy floods in Pakistan that impacted almost 20% of its population. As the rains continue in August water levels in rivers remain high and the devastating effects still are present across country. The Pakistani, U.S. and Afghan helicopters are used now (as on 20 August 2010) for delivery of relief supplies and evacuation of local population and tourists from affected areas. Bilateral assistance includes air transport of shelters, water purification equipment and medical supplies from several countries including United Kingdom, Australia and France. Both NATO and UE liaison teams evaluate the situation on the ground. Even if it is hard to predict right now the full scale of aviation assets commitment to flood response in Pakistan it is clearly visible they have been playing significant role in saving lives and alleviating suffering of affected population.

5 CONCLUSIONS

As the result of climate change hydrometeorological hazards will probably increase the number and severity of large scale natural disasters in the years to come while geological hazards will add to the spectrum of possible threats from the nature. The effective response to natural disasters becomes priority for international organisations, national governments and humanitarian organizations across the world. Unique capabilities of aviation assets such as speed, reach and versatility make them critical tool for disaster response. For foreseeable future aviation assets will remain the only means to provide relatively unrestricted access to population affected by natural disaster. In addition to airlift, SAR and ATM services aviation will increase support to disaster response by airborne surveillance and reconnaissance and command and control capabilities. Unmanned aerial systems will complement manned aircraft and the scope of their employment in disaster response will probably increase in a way similar to combat scenarios.

The lessons observed during disaster response operations in last decade provide some useful insights on possible roles, capabilities and organization of aviation assets in response to catastrophic events. Emerging technological capabilities show potential for new developments related to the employment of aviation assets in disaster response operations. Taking into account the importance of the subject it definitely deserves more thorough research.

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