

## **Sky Lanterns and Aviation Safety: A Study at the Mae Fah Luang Chiangrai Airport**

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**Abstract:** The purpose of this research is to study explore the challenges emerging due to use of sky lantern at the Mae Fah Luang Chiangrai Airport which has threat to aviation safety. The current pertaining is qualitative research done by in depth interview of aviation personnel at Chiangrai Airport. The finding of the study can be summarized as follows. Lantern obstructs visibility of flight path posing challenge to both pilot and air traffic controller. Lantern can accidentally slip into aircraft engine and it could jam the engine or could cause engine explosion. Lantern slips into aircraft controlling equipment, this could cause aircraft unable to control its direction. Lantern that floats and sticks with aircraft body could cause fire to aircraft body. Lantern that falls onto runway or airport drive way, may endanger aircraft while take off and landing or it could damage aircraft during taxiing on the runway. However, it is opined by respondent to jointly organize community awareness campaign to educate people and mitigate the associated threat.

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**Key words:** Safety, lantern, aviation, airport drive, educate people, respondent

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### **INTRODUCTION**

**Background and the importance:** The market capitalization of the aviation industry in Thailand has reach 4-5 hundred millions Baht each year. With the advent of low cost airlines last 10 years in Thailand, the country has reach domestic and international passengers to 80-90 million people, respectively in 2016. With the phenomenally, increases air traffic, government have duty to supervise aviation safety. They must a strictly adhere to aviation safety standard management in system in order to reduce chance and risk of accident in aviation. The definition of the word “Aviation safety” has covered up with theory, investigation and to distinguish defect and failure in aviation. Prevention of the aforementioned incident must have measures, study and training which will bring out the body of knowledge to apply and spread out to public.

The safety problem in aviation from the use of sky lantern have increased and poses a threat aviation safety. However, during many years ago until now, there have been reports from pilot that there are always lantern floating in the sky at the close range of the flying routes that might cause damage to aircrafts that fly in the direction. Apparently, if accident happens, it will damage severely to both airlines and passenger life and property including national reliability image in aviation, tourism and in overall the national economy. Lantern is the name that named after one of the small hot-air balloons that

when light and release it, it can float in the air. Thus, it usually made from transfixed bamboo frame and glued with oily mulberry study. Thus, inside the balloon contains candle or fuel that when once is lit, the heat inside the lantern will lighten up the lantern and starts to activate the lantern to drift and float in the air. Lantern can float in the air as long as there is still burning combustion and it will drop down to earth a gain when burning fuel has gone. The Mae Fah Luang Chiangrai Airport, Airports of Thailand Public Co., Ltd. has area and responsible for aviation service to general aircrafts (Anonymous, 2016a) has been affected with the lantern (hot-air balloon) use because of the community that lives close to the airport responsible radius like to use lantern each year in accordance with their old ancient festival inheritance. The related units have continuously cooperated to campaign to reduce dangers from the mentioned problems.

From the aforementioned safety problem, researcher realizes significantly to the study about aviation safety of sky lantern at the Mae Fah Luang Chiangrai Airport with the 5M Theory (Somchanok Tienteaprat in 2007 referred with Klangpradit and Nivarin, 2010) in order to study and summarize the research outcomes which will be as guidelines in danger prevention from the sky lantern use towards the national aviation safety and to propose guidelines to responsible units to apply as supportive guidelines in decision making for future regulations.

**Research objectives:** To explore the threats of using sky lantern to the aviation safety in the vicinity of the Mae Fah Luang Chiangrai Airport.

**Research benefits:** To be able to specify the danger from the use sky lantern towards the aviation safety of the Mae Fah Luang Chiangrai Airport.

The research will be useful to the Civil Aviation Authority of Thailand to the Airports of Thailand Public Company Limited to the Aeronautical Radio of Thailand Ltd and to the Thai Lion Air Airlines and offer aviation stakeholders to design and implement safety framework to the current pertaining.

**Word definitions:** Safety means risk status that will endanger a person or will minimize property or in the acceptable level by using specification process to specify danger and risk management from the danger status.

Aviation safety means activity processes to prevent the loss of life and property from the people that relate to airport accident or accident that relate to aviation. The main objective of aviation safety is to prevent accident in order to preserve life and property of the people that concern about aviation accident and to accomplish the mission.

Lanterns mean the name that named after one of the small hot-air balloon that light and release to float in the air. Thus, it usually made from transfixed bamboo frame and glued with oily mulberry study. Thus, inside the balloon contains candle or fuel that when once is lit, the heat inside lantern will be lighten up the lantern and start to activate the lantern to drift and float in the air. Lantern can float in the air as long as there is burning combustion and it will drop down to earth again when burning fuel has gone.

Aviation means aviation description or arts. It does not simply mean airplane that can fly but it starts with the design, development, manufacturing, process and the use for aviation.

The Mae Fah Luang Chiangrai Airport means the Mae Fah Luang Chiangrai Airport, Airports of Thailand Public Company Limited, locates at Tumbon Ban Du ampur Muang Chiangrai, Chiangrai Province and has officially started to operate on August 5, 1992.

**Literature review:** The researcher has conducted a systematic literature review to the current pertaining. Related concept, theory and research study are detailed.

**Aviation safety concept and theory; Natsuda (2009):** The most important thing in creating aviation safety is to lay on the fundamental and understanding of safety

philosophy to everyone in the organization in order that organizational staffs and administrators have correctly understood the topic of safety.

Somchanok Tiemteaprat said that aviation safety is the activity process for preventing the loss of property and life of a person who is related to airport, accident or accident that related to aviation. The main objective of aviation safety is to prevent accident in order to save life and property of the person who is related to aviation accident and to accomplish the mission.

Anonymous (2016b) safety is the risk status that will endanger a person or will minimize property or in the acceptable level by using specification process to specify danger and risk management from the danger status. Aviation safety in accidental descriptions can be divided into the following categories:

- Airplane crashes by itself (resulted from the aircraft) because of engine defect or engine trouble, weather or airplane hijacking
- Airplanes crash into one other (because of people/pilot or air traffic controller). Aircrafts may crash into one other during takeoff and landing or they could hit one another while flying in the air
- Airplane hits with barriers (because of people/pilot/air traffic controller or ground service personnel). Barriers could be in the forms of both nature and human made)

Somchanok Tiemteaprat (referred with Klangpradit and Nivarin, 2010) 5M Theory. Modern age aviation safety program is important factor in aviation business administration because it is the compulsion in many things that we have been taught in the aviation safety program. However, its objective is guidelines to prevent accidents. Causes of accident can distinguish by the so-called “5M” elements. However, each of the elements has relationship in relation to one another. Hence, if any factor has changed, it will affect to the other too. Therefore, if this happens and unable to control, it will create risk towards the aviation safety. The 5M is consisted of:

- Man/Human factors are people that relate to aviation such as pilots, aircrews, aircraft mechanics, air traffic control officers and other ground service personnel
- Machine/Material factors mean machine components or materials and other equipments that relate to aviation
- Media/Environment factors such as weather, natural phenomenon, aviation facilities and barriers while operating aviation

- Mission is various missions that have different risks in accordance with aviation objectives that has been established
- Management is the vast element that relates to every element and that will lead to accident

**History of lantern:** In Asia and many other places around the world, the tradition of hot-air balloon festival has occurred for a long time and for many centuries ago. Yet, it is the tradition of fun. The name “Lantern” is the name translated from Chinese name “Tien Teng”. However, lantern sometimes is called “Floating light” or “Floating candle”. Joseph Needham, historian and biochemist had explained that Chinese people had been trying to use small hot air balloon to send signal, since, 3 centuries before BC but the invention had been given to “Ju Kir Liang”, philosopher and military strategist (234-181 BC) with the nickname of “Kong Ming”. According to history with the nickname of “Kong Ming”, it is said that Kong Ming had sent message by air balloon to ask for help when he and his soldiers were surrounded by enemy. Therefore, with this reason, the lantern is well known in China as “Kong Ming Lantern” (Yinke, 2005).

As for Thailand, the background of “Kom Loy” (lantern or hot-air balloon) is called “Gom Loy”. The word “Gom” is the Northern local language which is the same word as “Kom”. Kom Loy (lantern) is called differently depending on different areas such as Kom Lom (wind lantern), Wow Kwan (smoke kite) or Kao Klong (rice box kite). Throughout the year, the Lanna tribe of the Northern of Thailand has used lantern for various festivals celebration or use for other special occasions. Floating lantern is Thailand folk tradition that local folks of the Northern and Northeastern parts like to do and normally will celebrate during the 12th lunar month. They believed that the launching of these lanterns will release their sadness and troubles away. Traditionally, Brahmin ceremony will hold this celebration of the 12th lunar month to worship the 3 deities. They are Shiva, Narayana and Brahma. But for Thai people we also celebrate lantern ceremony to worship Buddha’s relics and the Prachulamane Pagoda at the Tavatimsa Heaven and Buddha’s Footprint lantern launch. Furthermore, another crucial festival that use floating lantern is the Yi Peng Festival which will celebrate on the 12th lunar month by the Lanna’s calendar (same day as the Loy Krathong Day in the Thai Lunar Calendar, the 12th lunar month). Today, Thai people from all regions prefer to release lantern and join the ceremony with other various Thai traditions in the belief that they could be lucky and many Thais believed that it is the symbol of problems and worries cast away together with the lantern (Anonymous, 2016c).

**Dangerous of lantern towards the aviation:** Releasing of lantern may cause fire or severe fire and it is harm to the aviation safety of the airport. Its damage could cause the loss of life and public property such as fire at the airport, fire at the wood or it may be the cause of airplane crashes. The sky effect from the modern type of lantern, today, the new modern type of lantern has increased in more fuels in order that the lantern can be floated higher and longer in the sky without realizing that the effective consequence from the lantern while floating aimlessly by the wind in the sky can hit the flying airplane that is flying. This incident could cause damage to property and loss of people lives who are boarding the airplane. Besides, it has been confirmed from the pilots and from other related personnel that aircraft can be blown immediately. Yet, this is the danger that many people have overlooked.

Studied outcomes report from the Ministry of Transportation indicating about the danger of lantern release that may happen to aircraft or while aircraft is flying in the sky or may happen to aircraft while taxiing on the runway. The study can divide into 5 items of danger and the consequences that will happen to aircraft as follows (Anonymous, 2016d)

Lantern obstructs pilot’s vision. Usually when releasing lanterns, people normally prefer to continue to release with many lanterns. It obstructs pilot’s vision from the cockpit and it may be the cause of airplanes crash into one another or lanterns can be as barriers that airplanes could hit during takeoff and landing.

Lantern slips into aircraft’s engine may be the cause of aircraft explosion and crash. Lantern drifts to jam or sticks with aircraft’s important parts such as wings and control units or rudder. This may be the cause of engine defect and make airplane unable to control its directions. Lantern drifts to stick with the aircraft body may be the cause of fire to aircraft body.

Lantern that drops onto airport runway or drive way will endanger aircraft during takeoff and landing. Some leftover lantern residues on the runway may damage aircraft engine during taxiing or it may jam or stick to aircraft important parts such as direction control unit.

**History of the Mae Fah Luang Chiangrai Airport:** The Mae Fah Luang Chiangrai Airport the Mae Fah Luang-Chiangrai Airport locates at Tumbon Ban Du ampur Muang Chiangrai, Chiangrai Province has officially opened to operate on August 5, 1992 and affiliated with the Department of Commercial Aviation (DOA) (Presently has changed name to The Civil Aviation Authority of Thailand, the Ministry of Transportation. Later, the Department of Commercial Aviation has transferred the Mae Fah Luang Chiangrai Airport to the administration of

Airports of Thailand Public Company Limited on October 2, 1998 and Airports of Thailand Public Company Limited has converted it to Public Company Limited as in accordance with the governmental policy under the name of "Airports of Thailand Public Company Limited" on September 30, 2002 until now. Later, there was request from governmental units, private sector and people of Chiangrai Province, committees of the Airports of Thailand Public Company Limited agreed to add on the name of Chiangrai province to the airport name as Mae Fah Luang Chiangrai in order to honor and pay homage to her royal highness princess mother Srinagarindra and to commemorate her royal highness. Besides, the Airports of Thailand Public Company Limited had received his royal permission from king Bhumibol Adulyadej, King Rama 9 to use that name, since, March 13, 2010 (Anonymous, 2016d). Today, the Mae Fah Luang Chiangrai airport has 4 airlines that provide services to more than 700,000 passengers per year with daily flights of 18 flights (round trip), cargo terminal can be able to handle more than 5,000 tons of cargo per year and has passenger terminal size of 22,960 m<sup>2</sup> which can handle 1,240 passengers during busy hours. Air traffic control service is serviced by Aeronautical Radio of Thailand Ltd. that stationed in Chiangmai with the rotation of 3 persons for each shift and last for 2 weeks long.

**Related research works:** By David (2013), the Civil Aviation Authority (CAA) has provided quantifiable evidence to the study in the form of Mandatory Occurrence Reports (MORs). A total of 48 of these were reported to be due to sky lanterns and helium balloons between 2001 and 2012 with sky lanterns accounting for the vast majority. Only four of the remaining eight were due to small helium balloons which are the focus of this report.

Sky lanterns pose a safety risk to aviation due to possible ingestion into engines when airborne. While aircraft are on the ground, sky lantern debris can pose a risk to taxiing aircraft and cause delays to take off and landing. CAA guidelines state that sky lanterns should not be released with 10 nautical miles of an air field but it is unlikely that the casual user is aware of this. Furthermore, there is an inconsistency between these guidelines and typical product guidance provided with sky lanterns. These state that CAA permission should be sought if lanterns are to be released within five miles of an airport or landing strip. We conclude that there is a clear need for better consumer information from suppliers that is consistent with CAA guidelines.

## **MATERIALS AND METHODS**

This research is a qualitative research by using in depth interview of the sampling group who research in the duty related to aviation safety at the Mae Fah Luang Chiangrai Airport and the interview topics are as follow:

- The aviation safety from the sky lantern release at the Mae Fah Luang Chiangrai Airport
- Opinion and suggestion in problem solving of aviation safety in sky lantern release at the Mae Fah Luang Chiangrai Airport

**Population and sampling group:** Population used in this research are:

- Air traffic controllers of the Aeronautical Radio of Thailand Ltd. who are working at the Mae Fah Luang Chiangrai Airport
- Pilots from the Thai Lion Air airlines
- Officers from the Mae Fah Luang Chiangrai Airport, Airports of Thailand Public Company Limited
- Officers from the Civil Aviation Authority of Thailand

**Sampling group:** Sizes of sampling group of this research are 3 officers from the air traffic control, the Aeronautical Radio of Thailand Ltd. who have performed their duties at the Mae Fah Luang Chiangrai Airport. About 5 Pilots from the Thai Lion Air Airlines. 1 Officer from the Mae Fah Luang Chiangrai Airport and 1 officer from the Civil Aviation Authority of Thailand.

### **Research data collection**

**Primary data:** In order to achieve the objective of study, primary data utilized in form of in-depth interview with 3 sampling persons that research as air traffic controller at the Aeronautical Radio of Thailand Ltd. at the Mae Fah Luang Chiangrai Airport. Second sampling group are 5 pilots who reserach for Thai Lion Air Airlines. Third is 1 staff who reserach at the Mae Fah Luang Chiangrai and lastly, 1 person who research for the Civil Aviation Authority of Thailand. Whereas secondary data was also used to cross validate the finding.

## **RESULTS AND DISCUSSION**

The interview outcomes from the related and responsible people in this research can be concluded as follows.

**Air traffic controller, the aeronautical Radio of Thailand Ltd. At the Mae Fah Luang Chiangrai airport:** The 1st officer who research for the aeronautical radio of Thailand at the Mae Fah Luang Chiangrai airport used to issue NOTAM or warning announcement to every airline and pilot in order to acknowledge about the schedule of sky lantern release. Lately, there was a campaign to request for cooperation from the Chiangrai Province, the Mae Fah Luang Chiangrai airport, government offices and private sector to notify about sky lantern schedules and places that will arrange for the festival and to limit the releasing areas. For the very first year, there had no response as it should be but later year this measure has been cooperated respectively. Still, there were some areas that did not comply with the measure. The community is still smuggling to release lanterns but it is now reduced in numbers. From his personal experience, he had been notified by the pilot that around the routing of Mae Hong Sorn-Chiangrai, pilot found a group of lantern flied high to 13,000 ft. The pilot, then, requested to detour that flight in order to escape from the lantern. The control tower had also notified other pilots who were also flying in the same zone to be more careful with the situation. They are still lucky that the pilot was able to see the lantern from a far radius and no accident happen, otherwise if the pilot did not see the lantern, nobody could guess that the severe accident will happen or not.

The 2nd officer, after the night of the Loy Krathong Day when he came back to research in the morning, he had been notified from the airport runway inspector that there was a number of lanterns debris still falling on the runway, he had to clean those lantern residuals, otherwise, during taking off and landing, these lanterns may slip into the aircraft engines. The control tower and the Mae Fah Luang Chiangrai airport always instruct their officers to inspect the runway every day. That is why the runway still safe from all Foreign objects. It is impossible for us to forbid people to cancel their good old traditions, especially, people with the old ancient belief. After the issuing of the campaign measure about safety lantern cooperation, the problem from lantern has been dramatically reduced. That means people had offered their good cooperation in this matter but only when sometimes, it slightly happening just because of some impetuous teenagers or may be just because of their lack of knowledge about this matter.

The 3rd officer, used to participate in both governmental and private conference regarding the cooperation campaign in the topic of "Lantern/Smoke Lantern Festival Inheritance with Safety". Later, this measure campaign is very effective and satisfied. His job is to provide information to the community leader to

spread to local folk to know about lantern danger to aircraft and airport that if the accident happens, it will damage property, economy including community, province and national fames and finally the loss of life. After he had been with the service for 8 years, he had not yet experienced with the accident from this tradition but he had only received report from the pilot that there were lanterns floating by the flying route that the pilot was flying. And again he had been notified from the airport runway inspector that there were lanterns fell on the runway.

**Pilots from the Thai Lion Air Airlines:** The 1st pilot said that from pilot point of view, lantern is a Foreign object that may slip into aircraft engine and will be the cause of engine stopping and will be the cause for the aircraft damage. However, the question has that can lantern float to the flying level or not? On which he contended many pilots of the Thai pilot association used to come across with lanterns that floated in the sky up to the level of 20,000-30,000 ft. Hence, if pilots encounter this kind of situation how do we fix it because lanterns cannot control their directions. If this problem has ever occurred for sure that we need to stop such flights and not supposed to fly into such zones or the zones that have warning announcement as lantern's territory. Usually when there is festival, pilots will be warned not to fly into those areas. Pilots will detour to some other routes. Some airports, for example, Chiangmai and Chiangrai, they cancel flights to avoid accident cause of above mentioned problem.

The 2nd pilot had spoken that he had more than 10 times experience in his profession to come across with these Foreign Object Damage (FOD) that when some strong wind blow these Foreign object can damage the aircraft and it seems that the number of lanterns are increasing each year. Yet, no one can forbid it because it is the inherited from culture and tradition. To be honestly said if there still has no sign of occurrence or plane crash accident that many people have died with one's own eyes, people are still continuously pretending not to hear it. The visible minor solution and prevention to this problem is to forbid people to release lantern during aircraft flying times but still I think there are still some people who would try to violate it. Hence, for my own honestly personal opinion, i would like people to use the old original lanterns that have community standard and permit with numbers of lantern limitation including areas that are not allow to have lantern release. The lantern prohibited areas should be around 20 km way from the airport. I would think the chance of lanterns would cause damage to airport is very less because normally ordinary lanterns cannot float that high and they only float for 10-15 min.

The 3rd pilot lanterns invention today have developed to a more modern style than before that they can float higher and longer in the air. People have no idea of the threats because of floating lanterns while they are floating aimlessly with the wind in the sky can hit the flying airplanes and create damage to property and the loss of passenger lives who are aboard. It has been confirmed from many pilots and related units that the plane can be exploded right away. This is the danger that many people have overlooked. There should be some kinds of governmental and private sector cooperation to continue to preserve this beautiful tradition with safety, "Please stop, the impetuous disaster".

The 4th pilot "It happened finally", the frightful image that happened on December 18, 2015 at the Mae Fah Luang Chiangrai Airport. When the inspector officer found the remaining lantern debris inside the A 320 engine that flew Chiangmai-Chiangrai and the flight had been canceled and he had to transfer passengers to some other flights. We still lucky today that the lantern did not slip into the main engine or else, the aircraft could be on fire and exploded. This time we still lucky that pilot can land the aircraft safely and it was not cause of any damage and danger to property and the loss of Thai and Foreign passenger's lives. Thus, the aircraft had to wait for Bangkok technician team to come to maintain and inspect the engine and to see if it can go back to service again and we have wasted for a day. Who's going to responsible about aircraft damage if the aircraft had ever crashed? Who's going to responsible for the passenger's death and property loss? The release of lanterns is the belief of releasing your sadness away but it blows away damages to others.

The 5th pilot the problem of sky lantern or smoke lantern release today is continued violently increasing. It results from the modern materials, equipments and technology development that are brought to produce it. Therefore, if the severe damage happens to the aircraft or the airport, it will affect viciously in overall to the national image, reliability and economy, especially our reliability that may have been down graded by the international aviation organization, for example, from the ICAO, IATA, EASA or FAA. They will prohibit our flights to fly over to Europe America or other countries, etc. However, it will strongly affect Thailand's aviation industry including tourism, too. I, myself, personally never come across directly with this experience, I have only been told by pilot friends that they have come across with the situations. At present, airlines have measure to avoid this problem by cancelling the flights during the lantern season in order to reduce problem that may occur by this incident.

**Officer who research at the Mae Fah Luang Chiangrai airport, airports of thailand public company limited:** The officer at the Mae Fah Luang Chiangrai Airport contended ever, since, 2001 problems from lantern that affect to the safety of aviation and airport are continued every year during the Loy Krathong day or the Yi Peng Festival of the Northern province but the severe situations have been reduced, respectively. Meanwhile, the result must be coming from the knowledge campaign that they have been provided including regulation enforcement to the wrong doer or law violator. The danger prevention measure for the mentioned problem has been continuously campaigned but it is difficult to solve the problem completely because of the old ancient tradition that has been passed down. Therefore, it is the responsibility of the related units to notify the community of the associated dangers and risks that may happen, including to apply for the regulation enforcement pertaining to lantern's sizes, materials used for making the lanterns/smoke lanterns. Apart from this, the authority should restrict time duration for flowing of lantern/smoke lanterns. For the airlines part, they have coordinated with the airlines to cancel or postpone flights when there are massive lanterns floating especially during the early night to midnight of the Loy Krathong Day. In order to avoid the danger from the aforementioned problem, we would like to ask for air traffic controller and the control tower cooperation to follow up with sky lantern/smoke lantern discovery reports and report to the flying pilots in order to avoid the dangers. I have still never seen yet of the danger experience from the sky lanterns that destroy lives and damage property toward the airplanes that are flying to the Mae Fah Luang Chiangrai Airport. So, far there was an incident that damaged the airport but it was only a minor one. There is tendency to decrease the problem continuously and hope that it will not happen in future again.

**Officer from the Civil Aviation Authority of Thailand:** The Civil Aviation Authority of Thailand (CAAT) is the government agency responsible for aviation safety of Thailand. The CAAT has specified responsible for safety pertaining lantern to floating towards the airport and is effective all along during the lantern festival. Each year, CAAT receives information news of the danger problem that comes from floating lantern/smoke lantern toward airport and toward many others airports especially always during the Loy Krathong day. I have never seen the danger incident that cause the loss of passenger life or hurt there was only a report that reported about aircraft damage only. The Civil Aviation Authority of Thailand is the unit that issue regulations and police officer are the recipients

who enforce the regulations. Therefore, CAAT would like to ask for cooperation from every part of region to assist awareness campaign to community with lantern/smoke lantern floating activity. It also releases the specified regulation criteria of lantern/smoke floating by notifying dates and times of activity to the related units including to cultivate the good conscious in safety traditional inheritance. Do not violate the law or do it with impetuosity or do it with unaware of the facts because if the danger situation would have had happened, the values of loss of life and property are tremendous that one can not estimate. But for the most serious issue, it will affect Thailand aviation reliability from many countries that are our aviation allies too. The CAAT hopes that the danger from lantern/smoke lantern use will be reduced until there will be no more of aviation danger report in the future.

## CONCLUSION

The interview outcomes analysis of the aviation safety from the sky lantern use at the Mah Fah Luang Chiangrai Airport may conclude with the interview analysis that specified the danger of using lanterns that may happen to aircraft while flying in the air or taxiing on the ground and can be divided into 2 parts as follows:

- The aviation safety from lantern release at the Mah Fah Luang Chiangrai Airport
- Opinions and suggestions in problem solving concerning about aviation safety from lantern usages at the Mah Fah Luang Chiangrai Airport

**Part 1:** The aviation safety from lantern release at the Mah Fah Luang Chiangrai Airport. Conclusion of the studied outcomes of aviation safety from lantern release at the Mae Fah Luang Chiangrai Airport from the sampling group can be summarized as follows:

- Lantern obstructs flight path and it affects both pilots and the air traffic controllers in safe air navigation
- Lantern slips into aircraft engine, it may cause engine trouble and explode
- Lantern slips into and sticks with the control equipment, aircraft can not control the directions
- Lantern that floats to stick with aircraft body, may cause damage to aircraft body
- Lantern that fall on airport runway or drive way will endanger aircraft while taking off and landing or while aircraft is taxiing

The studied outcomes are related to the 5M theory that quoted "When any factor has changed, it will affect to other factor too". If it is uncontrollable, it risks the aviation safety. Lanterns are environmental factor or they are among the flying aircraft that affect in aviation safety. Therefore, this studied outcomes are relevant with the study report of the Ministry of Transportation that quoted about the danger of sky lantern release may happen to aviation safety (Anonymous, 2016d).

**Part 2:** Opinions and suggestions in problem solving about safety of lantern release towards aviation at the Mah Fah Luang Chiangrai Airport.

In sum and substance follow suggestions are obtained for the current pertaining. Due to the lantern festival in the area of Northern Region of Thailand is the traditional inheritance and has been continued for a long time in the past there was less flights flying to the Mae Fah Luang Chiangrai Airport, so, there was also less problem and nonviolent. Today, since, flights have increased in order to handle the continual growth of the national aviation industry. Hence, also more durations are noticed. The modern material being used in manufacturing of lantern is also contributing. Hence, it is observed that lanterns are bigger and can float higher and longer in the air, results of this development are affected in aviation safety. It has risk, high danger and more violent which may cause the loss of life and property. Also, it affects intensely to the national image, reliability and economy especially the country may be downgraded by the International Aviation Organization which will strongly affect the Thai Aviation Industry and Tourism in the negative way.

The sustainable of problem solving in lantern release towards the aviation safety must have the cooperation from many related units such as, the Civil Aviation Authority of Thailand, the Aeronautical Radio of Thailand Ltd., Airports of Thailand Public Company Limited, airlines, government and private sector to provide community awareness about the lantern usage and its associated threats during the aforementioned festival. Community cooperation regarding it's the restricted use pertaining to time including geography may be devised of enforced. Also, restricted regulation pertaining to size and material may be made. Thus, for the flights with the airlines coordination to postpone or cancel flights during massive lanterns release in order to avoid dangerous safety problems. Lastly, request the air traffic controllers or the airport control tower to follow up with sky lantern reports from pilots that are flying by the route or send message to other pilots to acknowledge in order to avoid the danger from the foretold problems.

### **LIMITATIONS**

This research is the qualitative research base on interview which may render biased results. The overall, theory, concept and research outcomes that used for data source for this study are few because few researchers are interested to study about this research topic.

### **SUGGESTION**

The same topic can be studies for major airports in Thailand and results may be compared.

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