International Airborne Geophysics Safety Association

"SAFETY IN THE AIR BEGINS ON THE GROUND."

IAGSA Member Self-Assessment Questionnaire

Company Name:	**Terraquest Ltd**
Location:	**Markham ON**
Date of Assessment:	**January 15, 2018**
Assessment Questionnaire completed by:	**Howard Barrie**
Key Management Personnel	**Position**
Howard Barrie	**President**
Charles Barrie	**Vice- President**
Stephen Barrie	**General Manager**
Total # Employees:	**~10**

Contents

Planning – All Operations			
Title	**IAGSA Recommendation**	**Compliance Level**	**Explanation of Compliance**
Survey Planning	The following is a list of IAGSA Recommended Practices which all members should take into account when planning airborne survey operations regardless of type of survey or terrain.		
	Prior to commencing a survey, do you conduct a detailed risk assessment which identifies the safe survey height?	x Always ☐ Sometimes ☐ Never	TQ Risk Analysis Doc
	Prior to conducting a survey do you establish a crew rotation schedule which considers factors such as remoteness of site, severity of climate, quality of accommodation, food and personal considerations?	☐ Always x Sometimes ☐ Never	TQ Risk Analysis Doc
	Do you have a minimum temperature limit for cold weather operations?	x Always ☐ Sometimes ☐ Never ☐ N/A	HSE 7.4.1.2

	Do you limit the use of aircraft heaters or air-conditioning in the interest of "clean" data?	☐ Always x Sometimes ☐ Never	
	Do you require the use of oxygen for all aircrew for survey flights or portions thereof conducted above 10,000 feet ASL?	☐ Always x Sometimes ☐ Never	
	Do you have a drug and alcohol policy?	x Yes ☐ No	HSE 6.3.12 and 7.4.5
	Are aircrew members required to wear long trousers or a flight suit, closed shoes, have gloves available and clothing appropriate for the environmental conditions?	x Always ☐ Sometimes ☐ Never	HSE 6.3.3 and 7.4.1.1
	For fixed wing surveys, is a risk assessment conducted to determine whether or not helmets should be worn by the flight crew members?	☐ Always ☐ Sometimes	

		x Never ☐ N/A	
	For helicopter surveys, are the flight crew members required to wear a flight helmet?	☐ Always x Sometimes ☐ Never	At the discretion of the heli charter company
	Are flight crew members paid or given an incentive based upon hours or kilometers flown?	☐ Always ☐ Sometimes x Never	
Emergency Response Planning	Do you develop project specific emergency response plans for each project?	☐ Always x Sometimes ☐ Never	Operational Emergency Response Plan HSE 6.2.3
	Does your company have an overall crisis management plan?	x Yes ☐ No	Operational Emergency Response Plan
Flight Following	Do you operate a satellite tracking system on all aircraft?	x Always	HSE 7.2.1.2

		☐ Sometimes ☐ Never	
	Is the position reporting frequency of the tracking system set to 2 minute intervals as a minimum?	☐ Yes ☐ No	Usually between 30 seconds to 1 minute
Single Pilot Only Surveys	Do you conduct single Pilot Only Surveys (no equipment operator)?	☐ Always ☐ Sometimes x Never	HSE 7.2.1.7
	If so, does the Pilot have equipment operation duties in addition to those normally associated with flying the aircraft?	☐ Always ☐ Sometimes ☐ Never x N/A	
	Are additional risks associated with single pilot only operations detailed in the risk assessment?	☐ Always ☐ Sometimes ☐ Never	

		x N/A	
Operating Standards			
Minimum safe survey speeds	Are minimum safe survey speeds for single engine aircraft calculated at 130% of clean stall speed (Vs)?	x Always ☐ Sometimes ☐ Never	HSE 7.2.2.1
	Are minimum safe survey speeds for Multi-engine aircraft: 110% of best single engine rate of climb speed (Vyse), or minimum safe single engine speed (Vsse, if published)?	☐ Always ☐ Sometimes ☐ Never ☐ N/A	HSE 7.2.2.1
Minimum Fuel Standard	Is fuel planning for survey flights based upon 110% of planned consumption?	☐ Always ☐ Sometimes ☐ Never	HSE 7.3.2.12 & 7.3.3
	Is minimum reserve fuel calculated as 30 minutes for fixed wing and 20 minutes for helicopter at normal cruise consumption rates?	x Always ☐ Sometimes ☐ Never	HSE 7.3.2.12 & 7.3.3

	Do planned minimum fuel reserves consider site specific contingencies?	x Always ☐ Sometimes ☐ Never	HSE 7.3.2.12 & 7.3.3
Flight and Duty Times	Are the following Flight & Duty Times adhered to?		
Single Pilot Operation Maximum Flight Times	A maximum of 8 hours flight time per day.	x Always ☐ Sometimes ☐ Never	HSE 7.2.1.4
	A maximum of 5 hours flight time on survey per day (excluding transit time)	☐ Always x Sometimes ☐ Never	HSE 7.2.1.4
	A maximum of 40 hours flight time in any 7 consecutive day period	x Always ☐ Sometimes ☐ Never	HSE 7.2.1.4
	A maximum of 100 hours flight time in any consecutive 28 day period.	x Always	HSE 7.2.1.4

		☐ Sometimes ☐ Never	
	A maximum of 1000 hours in any consecutive 365 day period.	x Always ☐ Sometimes ☐ Never	HSE 7.2.1.4
	If extensions to the single pilot flight times are used has the extension criteria recommended by IAGSA been met?	☐ Always ☐ Sometimes ☐ Never x N/A	
Dual Pilot Operations Maximum Flight times	A maximum of 10 hours flight time per day.	☐ Always ☐ Sometimes ☐ Never	N/A
	A maximum of 8 hours flight time on survey (excluding transit time).	☐ Always ☐ Sometimes ☐ Never	N/A

	A maximum of 45 hours flight time in any consecutive 7 day period.	☐ Always ☐ Sometimes ☐ Never	N/A
	A maximum of 120 hours flight time in any consecutive 28 day period.	☐ Always ☐ Sometimes ☐ Never	N/A
	A maximum of 1200 hours flight time in any consecutive 365 day period.	☐ Always ☐ Sometimes ☐ Never	N/A
Maximum Duty Times	The maximum duty time in any one day shall not exceed 14 hours	☐ Always ☐ Sometimes ☐ Never	N/A
	The pilot shall have a minimum of 2 days rest within a 14 day period. These may be taken separately or together. If taken separately, one day rest shall be defined as 30 consecutive hours free from duty.	☐ Always ☐ Sometimes ☐ Never	N/A

Emergency Beacon / Radio	Is each aircrew member required to carry on their person essential survival items including: a personal locator beacon means to start a fire, knife and a signal mirror?	☐ Always x Sometimes ☐ Never	
Fuel Quality Control – Storage Tanks	The quality control of the fuel varies considerably at smaller centres. The crew must determine the adequacy of this quality control and take all available means to ensure against boarding contaminated fuel. Is there a procedure in place to ensure that the following checks are required anytime a fuel source is unknown or questionable:		
	Check that Fuel Quality Control Check and Delivery documents are current and available.	x Always ☐ Sometimes ☐ Never	HSE 7.2.1.5
	Check that the fuel servicing vehicle / facility is identified with the fuel type handled.	x Always ☐ Sometimes ☐ Never	HSE 7.2.1.5
	Check that the facility is clean and maintained.	x Always ☐ Sometimes ☐ Never	HSE 7.2.1.5

	Check that bonding wires and connections are in good condition.	x Always ☐ Sometimes ☐ Never	HSE 7.2.1.5.2
	Check that filter systems are in place and date of last element replacement.	x Always ☐ Sometimes ☐ Never	HSE 7.2.1.5.2
	Check that a sample is clear and bright downstream of the filter.	x Always ☐ Sometimes ☐ Never	HSE 7.2.1.5.2
	Request or conduct a water test with paste or syringe and capsules.	x Always ☐ Sometimes ☐ Never	HSE 7.2.1.5.2
	Check that a sample from the low point of the tank is clear bright and free of water. If there is no low point water	x Always ☐ Sometimes	HSE 7.2.1.5.2

	drain, do a dip of the tank using water paste.	☐ Never	
Fuel Quality Control - Drums	When using drummed fuel are there procedures in place to ensure the following requirements?		
	Verify the expiry date of the drums.	x Always ☐ Sometimes ☐ Never	HSE 7.2.1.5.2
	A "go no-go" filter be used for all refueling from drums.	x Always ☐ Sometimes ☐ Never	HSE 7.2.1.5.2
	All drum fuel is visually checked for clarity and color and water tested with paste or fuel syringe and capsules before use.	☐ Always x Sometimes ☐ Never	
	Only clearly branded drums with both seals intact are be used unless the pilot knows the "history" of the drum since the seals were broken and retests the fuel for contamination before use.	x Always ☐ Sometimes ☐ Never	

	Aircraft sump drains be checked before the first flight of the day and after each refueling.	x Always ☐ Sometimes ☐ Never	
	Drums are stored on their sides, clear of the ground with bungs horizontal in an area not subject to flooding. Under-cover storage should be considered if drum stock are to be kept for a long time.	x Always ☐ Sometimes ☐ Never	
	When not in use, fuel pumps are protected from water and other contamination.	x Always ☐ Sometimes ☐ Never	
	Bungs should be sealed and the drum placed on its side for short term storage (i.e. overnight) of a partially filled drum.	x Always ☐ Sometimes ☐ Never	

Night Surveys	Typically, survey flights are conducted at low heights in day VMC, but if the low height is removed coupled with a smooth air requirement, such as for gravity surveys, it may be desirable to conduct night flights. Such flights can be conducted safely as long as there are adequate procedures to prevent a "controlled flight into terrain" CFIT accident. Are procedures in place to ensure the following requirements:		
	Are night surveys flown at least 1000 feet above all obstacles within the operational area and a 10 nautical mile buffer around the operational area? Does the operational area include the maneuvering area for line turns and lead-ins?	☐ Always ☐ Sometimes ☐ Never x N/A	
	Is a VMC reconnaissance flight performed in each block?	☐ Always ☐ Sometimes ☐ Never x N/A	
Monitoring of radios	During survey flights, are radios and transponders turned on and selected to the appropriate ATC or flight service frequencies.	x Always ☐ Sometimes	

	Additionally, equipment permitting, common air to air and emergency frequencies (121.5MHz) should also be monitored.	☐ Never	
Turning Radius	During straight and level flight there may be a significant margin above the stall speed, however in a steep turn the stall speed may be reached quickly with little warning and a stall in the turn at low level will likely result in a fatal accident.		
	Are all turns at low level limited to a maximum angle of bank of 30 degrees and be done at a constant altitude. Are climbs or descents allowed to be carried out during the turn?	x Always ☐ Sometimes x Never	HSE 7.3.4.8
Towed Geophysical Arrays			
Towed Geophysical Arrays – All aircraft types	This section applies to all airborne surveys utilizing geophysical arrays suspended below and/or towed by rotary or fixed wing aircraft.		
	Do you operate towed geophysical arrays?	x Yes ☐ No	
	Does the towed array have an STC/LSTC, engineering order or other similar certificate or	x Yes	

	statement describing array specifications and flight test data?	☐ No ☐ N/A	
	Is there an Operating Manual for each array?	☐ Yes x No ☐ N/A	General notes only @ this time
	Does the Operating manual identify the maximum safe operating airspeed for the array?	x Yes ☐ No ☐ N/A	
	Does the Operating Manual contain a parts list and maintenance manual containing the critical design specification for all parts and elements of the array?	x Yes ☐ No ☐ N/A	Included in the design manual
	Does the Operations Manual contain a pre-flight checklist?	☐ Yes x No ☐ N/A	

	Does the Operations Manual contain a schedule for routine preventative maintenance, recorded inspections and testing?	☐ Yes ☐ No ☐ N/A	
	Is there a procedure in place to ensure that all required maintenance, inspections and testing are up to date prior to job start?	x Yes ☐ No ☐ N/A	By the helicopter operator
	Is all maintenance performed by a qualified person endorsed by the manufacturer or operator?	x Yes ☐ No ☐ N/A	
Towed Geophysical Arrays – Rotary Wing Aircraft	Has the cable weight and length been determined by an aeronautical engineer as to minimize the potential for cable recoil into main and tail rotors following the loss of load?	x Yes ☐ No ☐ N/A	
	Is there a weak link incorporated into the load bearing cable?	x Yes	

		☐ No ☐ N/A	
	Is the weak link located as close as possible to the attachment hook of the helicopter?	x Yes ☐ No ☐ N/A	
	Has the breaking strain of the weak link been specified by an aeronautical engineer?	x Yes ☐ No ☐ N/A	
	Is the maximum towed array airspeed and VNE (Velocity Never Exceed) placard placed on the aircraft instrument panel in the Pilot's view?	x Yes ☐ No ☐ N/A	
	Does the cargo hook arrangement allow the pilot to jettison the load without removing his/her hands from the flight controls? Do procedures include the requirement to test the	x Yes ☐ No ☐ N/A	

	helicopter cargo hook release mechanism?		
Towed Geophysical Arrays – Fixed Wing	Is the aircraft fitted with a shearing mechanism which can cut the tow cable when the array needs to be jettisoned?	☐ Yes ☐ No ☐ N/A	N/A
	Does the tow cable have a breaking strain which minimizes damage to the aircraft in the event the array snagged with ground objects?	☐ Yes ☐ No ☐ N/A	N/A
Geophysical Survey Flight Training			
Training and Experience – All Operations	Does your training program contain a syllabus for low level geophysical flight training?	x Yes ☐ No	HSE 7.3.2
	Does the Pilot training syllabus reflect the IAGSA training guidelines?	x Yes ☐ No	Chief Pilot Docs
	Are there documented criteria to assess Pilot competency?	x Yes ☐ No	Chief Pilot Docs

Simulator Training	In addition to the training in the actual aircraft, do pilots, where practical, undergo simulator training in a type specific simulator representing the aircraft being flown on survey? If so, at what frequency?	☐ Always x Sometimes ☐ Never ☐ N/A	
Overwater and Offshore Surveys			
Minimum requirements for Over water and Off Shore Surveys	The following recommendations apply to all overwater and off shore surveys flown in both fixed wing and rotary wing aircraft.		
Training – Overwater & Offshore Surveys	Is Underwater Escape Training completed within the preceding three years before undertaking the over water or offshore survey.	☐ Always x Sometimes ☐ Never	
	Are Ditching & Emergency Evacuation Procedures reviewed, crew members thoroughly briefed and simulated training to be conducted at the work site prior to the start of all over water or offshore work. This review should include a review of general emergency procedures that could	☐ Always x Sometimes ☐ Never	

	potentially lead to a ditching and a discussion on the significance of sea state/wave height on ditching.		
Training - Off Shore Surveys	In addition to the above items, the following are to be included in offshore training:		
	Does Initial Training consist of a minimum of 10 hours training conducted by a pilot who has a minimum of 100 hours Offshore experience?	☐ Yes ☐ No	See below
	Does Recurrent Training consist of a minimum of 5 hours training conducted annually by a pilot with the same qualifications as for the initial training: or prior to the start of an Offshore survey if pilot has completed the initial training but has not flown Offshore for more than 90 days?	☐ Yes ☐ No	See below
	Alternatively, the above experience requirements may be waived if the Operator has in place a competency based training program which includes Offshore operations.		This is the case

Type of Aircraft – Over water / Offshore Operations	For an over water/offshore survey in an area with harsh conditions where the odds of surviving a ditching or the exposure that would follow are low then the emphasis must be placed on choosing an aircraft that reduces the probability of a ditching. Whereas, the aircraft criteria may be somewhat less stringent in less harsh conditions where the odds of a successful ditching and rescue are good.		
	For any survey that is over water or offshore in an area where rescue is not likely to occur within an anticipated acceptable exposure time and/or where anticipated sea states would make a successful ditching unlikely, is the use of a multi engine aircraft with performance characteristics such that in the event of an engine failure during an over water survey it can climb from survey height to 500 feet and return to shore or during an offshore survey it can climb from survey height and maintain prolonged flight on the remaining engine(s) to return to a suitable airport at the minimum IFR altitude utilized?	x Always ☐ Sometimes ☐ Never	The only aircraft that TQ utilizes of offshore ops is the King Air series

	Are single engine piston aircraft used for over water/offshore surveys?	☐ Always ☐ Sometimes x Never	
Aircraft equipment – Offshore	Are aircraft equipped with at least the following gyroscopic instruments, each of which must be independent of the others: 2 x attitude indicator; 2 x heading indicator; 2 x turn and slip indicator or turn coordinator?	x Yes ☐ No	
	If a second pilot is to be part of the crew, is there a complete second set of basic flight instruments (attitude indicator, gyroscopic heading indicator, turn and slip or turn coordinator airspeed, altimeter, vertical speed) installed at the co-pilot's seating position?	x Yes ☐ No	
	Are there at least two (2) independent power sources to drive the gyroscopic instruments?		

	- this may mean two vacuum pumps with all air driven gyroscopes or a mixture of air driven and electric gyroscopes provided loss of one power source leaves operational one set of three gyroscopic instruments (attitude, heading and turn rate indicators)	x Yes ☐ No	
	Is there a radio or radar altimeter with a means of alerting the crew when height above the water falls below a minimum safety height selected by the crew? Is there a means of testing the alerting device prior to flight?	x Yes ☐ No	
	Is there a minimum of one instantaneous vertical speed indicator (IVSI) to provide an instant alert of descent	x Yes ☐ No	
	Do you require the use of weather radar where	☐ Always	

	thunderstorms are present or could be expected?	☐ Sometimes x Never	
	Are Rotary wing aircraft equipped with floatation aids such as "pop-outs floats"?	☐ Always ☐ Sometimes ☐ Never	N/A
Emergency Equipment – Offshore Surveys	An upper torso restraint system, with a preference for a four point harness, for each crew member	x Yes ☐ No	
	Are aircraft equipped with a 406 MHZ ELT?	x Yes ☐ No	
	Is the crew provided a covered life raft with a self erecting canopy that is equipped with a 406 MHZ ELT and normal emergency survival equipment? Does raft should include an inflatable floor for cold water operations?	x Yes ☐ No	
	Are constant wear dual chamber life vests that contain	☐ Yes	

	an ELT aELT/EPIRB, flares and a signal mirror, worn by each crew member?	☐ No	
	Are immersion/exposure suits worn if water and air temperatures warrant?	x Yes ☐ No	
	Are all helmets and headsets fitted with double disconnect cords?	☐ Yes ☐ No	N/A
Weather – Offshore Surveys	Are Offshore survey flights conducted under VMC with minimums of 5 miles visibility and 1000 foot ceiling in the survey area?	x Yes ☐ No	
	Is a thorough weather briefing solicited (if available) and does it should include sea state/wave height and wind maximums in the survey area?	x Yes ☐ No	
Additional Training Requirements			
Fire Extinguisher Training	Do all crew members on survey flights, including equipment operators, receive annual training in the use of	x Yes ☐ No	

	fire extinguishers in fighting in flight fires?		
Survey Crew Resource Management Training	Is Survey Crew Resource Management training provided to all crew members assigned to survey operations including: geophysicists; pilots; equipment operators; maintenance engineers; field technicians and field support staff at intervals not exceeding three years?	☐ Yes ☐ No	
Flight Performance Monitoring			
Performance Monitoring	Is performance parameters, including aircraft speed, height above terrain and drape, periodically reviewed using data collected during surveys?	x Always ☐ Sometimes ☐ Never	This information is gathered and used daily in the processing of the geophysical data
	Is the frequency of review such that any discrepancies on a particular survey or by a particular pilot can be identified as early as possible?	☐ Always x Sometimes ☐ Never	