ADVISORY CIRCULAR

CAA-AC-GEN037A

October, 2018

APPROVAL TO OPERATE IN NORTH ATLANTIC HIGH LEVEL AIRSPACE

1.0 PURPOSE.

1.1.1 This Advisory Circular provides guidance and information to Flight Operations and Airworthiness inspectors on the evaluation of application for operational approval within the airspace designated as North Atlantic High Level Airspace (NAT HLA).

1.1.2 The airspace previously designated as NAT MNPSA was re-designated as NAT HLA on 04 February 2016. Aircraft operating within the NAT HLA are required to meet specified navigation performance in the horizontal plane through the carriage and proper use of navigation equipment that meets identified standards approved as such by the State of Registry/operator for the purpose. Such approvals encompass all aspects affecting the expected navigation performance of the aircraft, including the designation of appropriate cockpit/flight deck operating procedures.

2.0 APPLICABILITY

This AC applies to air operators intending to operate within the airspace designated as North Atlantic High Level Airspace (NAT HLA).

3.0 STATUS OF THIS ADVISORY CIRCULAR

This Advisory Circular is Revision 1.

4.0 EFFECTIVE DATE

This AC is effective from 24th October 2018.

5.0 WHERE TO FIND THE ADVISORY CIRCULAR

This AC can be found at the KCAA website: https://www.kcaa.or.ke/

6.0 REFERENCES

6.1 The applicable regulations include:

6.1.1 Regulation 16 of the Civil Aviation (Instruments & Equipment) Regulations 2018;

6.1.2 Regulation 131 of the Civil Aviation (Operation of Aircraft for Commercial Air transport) Regulations 2018; and

6.1.3 Regulation 37 of the Civil Aviation (Operation of Aircraft - General Aviation Aeroplane) Regulations 2018

6.2 The following are the applicable technical guidance:

6.2.1 RVSM Advisory Circular CAA-AC-GEN029;

6.2.2 Appendix I, NAT HLA Application Evaluation Checklist, CL: O-GEN037;

6.2.3 Appendix II, NAT HLA Oceanic Checklist;

6.2.4 Appendix III, Expanded NAT HLA Oceanic Checklist; and

6.2.5 Appendix IV Areas of Magnetic Unreliability.

7.0 DEFINITIONS

7.1.1 **ATS Surveillance service** is term used to indicate a service provided directly by means of an ATS Surveillance system.

7.1.2 **ATS Surveillance system** is a generic term meaning variously, ADS-B, PSR, SSR or any comparable ground-based system that enables the identification of aircraft.

7.1.3 **Conflict** is a situation that occurs when it is predicted that the spacing between aircraft, an aircraft and a defined airspace, or an aircraft and terrain, may or will reduce below the prescribed minimum.

7.1.4 **Multilateration** is a group of equipment configured to provide position derived from the secondary surveillance radar (SSR) transponder signals (replies or squitters) primarily using time difference of arrival (TDOA) techniques. Additional information, including identification, can be extracted from the received signals.

7.1.5 **Oceanic Entry Point** is a Point on the FIR boundary where the aircraft enters the first oceanic control area.

7.1.6 **Oceanic Exit Point** is a Point on the FIR boundary where the aircraft leaves the last oceanic control area.

7.1.7 **Procedural Control** is a term used to indicate that information derived from an ATS Surveillance system is not required for the provision of air traffic control service. (PANS-ATM).

8.0 GENERAL GUIDANCE AND REQUIREMENTS

8.1 A person shall not operate a Kenya registered aircraft in defined portions of the NAT HLA without an approval issued by the Authority pursuant to regulation 131 (4) of the Civil Aviation (Operation of Aircraft – Commercial Air Transport) Regulations 2018 and Regulation 37(6) of the Civil Aviation (Operation of Aircraft - General Aviation Aeroplane) Regulations 2018.

8.2 When aircraft are leased to operators in Kenya, the Authority shall issue the approval.

8.3 There are some special areas of navigation with routes separated by 15-60 nm. If an aircraft drifts into the airspace of an adjacent route a gross navigation error (GNE) occurs. GNEs are extremely serious. The potential for a collision is high because the resulting flight path can overlap the flight path assigned to another aircraft (possibly coming from the opposite direction).

8.4 The Approval for NAT HLA operations requires the Authority to check various aspects affecting navigation performance. These aspects include: the navigation equipment used, together with its installation and maintenance procedures; plus the crew navigation procedures employed and the crew training requirements.

8.5 The vast majority of North Atlantic flights are performed by commercial transport aircraft in the band of altitudes FL290 – FL410. To ensure adequate airspace capacity and provide for safe vertical separations, Reduced Vertical Separation Minima (RVSM) is applied throughout the ICAO NAT region.

Note: North Atlantic Operations Bulletins (NAT OPS Bulletins) are used to distribute information on behalf of the North Atlantic Systems Planning Group (NAT SPG) for the purpose of providing guidance to North Atlantic (NAT) operators on material relevant to their operations.

8.6 A large portion of the airspace of the NAT contains the majority of these NAT crossings routes and designated as the NAT High Level Airspace (NAT HLA) between FL 285 and 420 inclusive. Within this airspace a formal approval process by the State of Registry of the aircraft or the State of the operator ensures that aircraft meet defined NAT HLA Standards and that appropriate flight crew procedures and training have been adopted. The lateral dimensions of the NAT HLA include the following Control Areas (CTAs):

> REYKJAVIK, SHANWICK (excluding SOTA and BOTA), GANDER, SANTA MARIA OCEANIC, BODO OCEANIC and the portion of NEW YORK OCEANIC EAST which is north of 27°N.

8.7 For NAT HLA operation, the onboard navigation equipment of an aeroplane shall enable it to proceed in accordance with the flight plan and in compliance with ATS requirements with regard to NAT HLA and RVSM operations.

8.8 For NAT HLA operational approval, the operator shall meet the following requirements:

a) Crew training and operating drills;
b) Equipment installation and procedures;
c) Appropriate navigational equipment; and
d) Suitable use of equipment.

8.9 Special areas of navigation require navigational performance (necessary to reduce the risk of collision) on an internationally established level. For example, the HLA establishes the following demanding criteria—

a) The average lateral deviation (for any cause) cannot be greater than 6.3 nautical miles (nm) from the centerline of the assigned route over any portion of the route. (This lateral deviation will not be valid beyond January 2020).

9.0 APPLICATION AND APPROVAL PROCESS

9.1 General Requirements

9.1.1 The air operator shall make an application in writing 30 days before an approval for the commencement of their operation.

9.1.2 The operator shall complete the Five Phase Certification and Approval Process as outlined in the Authority guidance CAA-O-GEN003 (as amended). The formal certification process for special areas of operations may run concurrent with the process for performance-based

navigation certification of the operator.

9.2 Approval Responsibilities

9.2.1 The DASSR shall appoint a team of qualified and current inspectors for the approval process of NAT HLA. The Certification Project Manager (Flight Operations) shall have the primary responsibility to grant the operator approval for NAT HLA and AMU.

9.2.2 The assigned flight operations inspector will be considered qualified for the purposes of the evaluations and inspections required by this CIRCULAR, if that inspector—

a) Is qualified on the type of aircraft;
b) Has documented formal training in certification requirements for special areas of NAT HLA and AMU;
c) Has documented completion of OJT by a qualified instructor for special areas of NAT HLA and AMU; and
d) Has documented aircraft qualification of completion of LOFT simulator session for the application for special areas of operations -related procedures, including contingency procedures.

9.2.3 The Airworthiness Inspector shall be responsibility for the evaluation and approval of the airworthiness requirements and associated support programs. The assigned airworthiness inspector will be considered qualified:

a) With documented formal training in NAT HLA & AMU certification requirements; and
b) Has documented completion of OJT by a qualified instructor for special areas of NAT HLA and AMU operations Program and Conformance.

9.2.4 The successful completion of this task will require coordination between Flight Operations and Airworthiness as described in circular, CAA-O-GEN017(as amended).

10.0 AUTHORITY REVIEW AND EVALUATION OF APPLICATION

10.1 The Approval team, comprising Flight Operations Inspector (FOI) and Airworthiness Inspectors (AWI), shall evaluate the application package using the following checklists:

10.1.1 Appendix I, NAT HLA Application Evaluation Checklist, CL; O-GEN037

10.1.2 Appendix II, NAT HLA Oceanic Checklist CL: O-GEN037

10.1.3 Appendix III, Expanded NAT HLA Oceanic Checklist CL: O-GEN037

10.2 Airworthiness Considerations

10.2.1 Navigation Equipment

a) An assessment will be made to determine if the equipment listed in CAA-AC-GEN037, Section 10.2.1 is appropriate for the route to be flown and the operator's manuals, procedures and training program are adequate.

b) Navigation equipment must be approved and installed in accordance with the aircraft's type certificate (TC), a supplemental type certificate (STC) or an acceptable method approved by another ICAO State.

c) In any case, co-ordination should be accomplished with an Airworthiness Inspector to

ensure it is operational and installed correctly and that maintenance program and training are adequate.

10.2.2 Maintenance Program

a) Each applicant requesting NAT HLA operational approval must establish maintenance and inspection practices acceptable to the Authority that include any required maintenance specified in the data package.

b) Operators of aircraft subject to a continuous airworthiness maintenance program must incorporate these practices in their program

10.2.3 Maintenance Training

Verify that Maintenance personnel have been trained on NAT HLA maintenance procedures to include Minimum Equipment list for NAT HLA dispatch.

10.3 Flight Operations Considerations

10.3.1 Operations Manual

a) The applicants' Operations Manual must contain specific pre-flight, in-flight and post-flight procedures as well as crewmember procedures for the verification of waypoint entry information and other procedures to preclude navigation errors.

b) The applicants' Training Manual must include requirements for training and checking crewmembers on its operational use.

10.3.2 Training Considerations

a) Ground Training

i) The applicant requesting to operate within NAT HLA shall provide its flight crew members with the training specified in Section 8.4.2 of Advisory Circular CAA-AC-GEN037

ii) Flight/Simulator Training

iii) Flight/simulator training requirements shall be completed prior to approval for flight operations within NTA HLA being granted.

10.4 Once the Authority is satisfied with the information provided in the application package, the Authority will proceed to the validation phase.

11.0 VALIDATION FLIGHT

11.1 After the applicant has accomplished its training, a validation flight shall be conducted to evaluate the applicant procedures and knowledge of operations within NAT HLA.

Note: Where an operator previously conducted NAT HLA or MNPS and RVSM operations under an approval, the Authority may grant credit based on earlier approvals and experience by undertaking a validation on a commercial flight to complete the approval process.

11.2 Initial approval shall be granted to facilitate validation period.

11.3 A qualified and current Flight Operations Inspector shall conduct an en route inspection using Appendix II, Checklist, CL:O-GEN037, with special emphasis on the applicant NAT HLA

training subject areas.

11.4 The flight operations inspector needs to verify that the applicant flight crew for the validation flights has been trained and qualified for NAT HLA.

11.5 If the validation flight performance is satisfactory, operation for NAT HLA may be recommended for approval. If the performance is not adequate, the operator shall be notified in writing of areas of deficiency that must be closed before the approval is granted.

12.0 OPERATIONAL APPROVAL FOR NAT HLA

12.1 When the criteria for approval has been met and all open discrepancies have been closed, NAT HLA approvals shall be granted by issuing OpSpecs and adding that area of en route operation to the OpSpecs for each aircraft type. General Aviation Operators shall be issued a Letter of Authorisation.

12.2 Either of these documents must contain:

a) The navigation specification;
b) Define the airspace boundaries;
c) List the aircraft that have been approved, by type (make, model, series); and
d) Their navigation equipment.

Note 1: If aircraft of the same type are equipped with different navigation system configurations, they should be listed by the aircraft registration or serial number.

Note 2: The Authority will provide guidance on process and procedures for confirming the operator's capability to meet Approval for Operations Using GPS.

Note 3: The operator is not required to collect navigation performance data in NAT HLA to apply to Pass/Fail graphs.

13.0 MAINTAINING NAT HLA APPROVAL.

13.1 In addition to initially meeting NAT HLA criteria, each operator shall continuously maintain the required level of navigational performance.

13.2 Each gross navigation error (GNE) (errors of 25 NM or more) has a significant impact on flight safety in this airspace and shall be fully investigated in a timely manner. The cause of each error must be identified, and effective action taken to prevent reoccurrence of similar errors.

13.3 GNEs are detected by ATC and reported to one of the regional monitoring agencies of the world. The regional monitoring agency then provides notification of GNE to the operator that made the GNE.

13.4 When the Authority learns of a GNE by an operator, the Authority shall determine the effectiveness of operator's actions as follows:

a) If it is determined that an operator's actions will prevent the occurrence of similar errors, the operator should be permitted to continue NAT HLA operations with close surveillance of the operator's navigational performance. If similar errors occur in subsequent operations more frequently than permitted by the standard, stronger action must be taken.

b) If an operator fails to act to improve navigation performance, action shall be initiated to

suspend NAT HLA authorization.

c) If it is determined that an operator's actions to improve navigational performance are inadequate or otherwise unsatisfactory, the operator will be notified that the corrective action is unacceptable.

When an operator does not implement a satisfactory solution in a timely manner, the action shall be initiated to suspend NAT HLA authorization, and it could include enforcement action.

13.5 Currently renewal of NAT HLA Operational Approval is not applicable as long as the aircraft remains eligible and the operator complies with the operating procedures.

13.5.1 However, should an operator suspend its operation in the NAT HLA for a period of sixty days, the Authority may require the operator to validate the approval as contained in the operator's operating procedures.

14.0 INVESTIGATION AND CORRECTION OF GROSS NAVIGATION ERRORS

14.1 In addition to initially meeting NAT HLA criteria, each operator must continuously maintain the required level of navigational performance.

a) The cause of each error must be identified and effective action must be taken to prevent reoccurrence of similar errors.

b) Gross navigational errors (GNE) are detected by ATC and reported to one of the regional monitoring agencies of the world.

c) The regional monitoring agency then provides the notification of the GNE to not only the operator that made the GNE but also to the Authority.

d) The Flight operations inspector in turn review the GNE.

e) During that investigation, the inspector learns of a GNE by one of his/her operators, the inspector must immediately contact the operator and advise that the GNE will be investigated

f) The Flight operations inspector must ensure that the operator takes timely corrective action.

14.2 After this notification, inspectors must determine the effectiveness of the operator's actions as follows—

a) If it is determined that an operator's actions will prevent the occurrence of similar errors, the operator should be permitted to continue NAT HLA operations with close surveillance of the operator's navigational performance. If similar errors occur (in subsequent operations) more frequently than permitted by the standard, stronger action must be taken.

a) If an operator fails to act to improve navigation performance, action must be initiated to suspend the NAT HLA authorization, by rescinding the operations specification.

b) If it is determined that an operator's actions to improve navigational performance are inadequate or otherwise unsatisfactory, the operator must be notified that the corrective action is unacceptable. When an operator does not implement a satisfactory solution in a timely manner, the action must be initiated to suspend NAT HLA authorization and could include enforcement action.

Kenya Civil Aviation Authority

APPENDIX 1

NAT HLA APPLICATION EVALUATION CHECKLIST

CL: O-GEN037

GENERAL PARTICULARS			
Name of operator/applicant		Captain's Licence No.	
Address		First Officer's Licence No.	
Telephone		Flight Engineer's licence No.	
E mail		Flight Number	
Location/From		Type of operation	
Aircraft Registration		Aircraft Type and model	
Serial Number			
Date of evaluation/Inspection			
Inspectors (This Activity is coordinated between FOI and AWI)			

Assessment code: YES=Satisfactory; NO=Not Satisfactory; N/A = Not applicable

Item	Assessment	YES	NO	N/A
A.	Are the following addressed in the Application package?			
1.	Application letter within 30 days before commencement of operation			
2.	Operations Manual, Checklists and SOPs providing specific guidance on NAT HLA operations			
3.	Operator's training programme for flight crew operations in NAT HLA airspace adequate			
4.	NAT HLA operating practices and procedures incorporated in operations manual and documents			
5.	Contents of the operations manual on practices and procedures for NAT HLA operations complete and correct			
6.	If the operator has a separate NAT HLA manual, it is complete and correct			
7.	Are the details in CAA-AC-GEN037 contain training programs for -			
	(a) Flight crew?			
	(b) Flight Operations Officer / Dispatch and Operational Control?			
8.	Are the following required pilot knowledge elements as described in flight crew training programmes and manuals-			
	(a) Guidance to pilots in the event of equipment failures or encounters with turbulence after entering NAT HLA airspace?			
	(b) Expanded NAT HLA equipment failure and turbulence scenarios?			
	(c) Contingency procedures published in ICAO document 7030, Regional Supplementary Procedures.			
	(d) Wake Turbulence Procedures?			
	(e) NAT HLA Transition Areas?			

B.	**Airworthiness consideration**			
9.	Are the following items addressed in the applicants' documents?			
	(a) NAT HLA Maintenance procedures training;			
	(b) The MEL includes items pertinent to operations within NAT HLA airspace;			
	(c) Plans for participation in variation and monitoring programmes for NAT HLA;			
	(d) The method of notifying the flight crew that the aircraft is not "NAT HLA Qualified" but is still airworthy for non-NAT HLA flights;			
	(e) Identification of NAT HLA maintenance items that will render the aircraft unfit for NAT HLA flight, but is still airworthy for non-NAT HLA flights;			
	(f) Procedures to notify the Authority of gross height keeping errors and revalidation of the aircraft;			
	(g) Maintenance procedures on restricting aircraft identified as exhibiting height keeping performance errors from operating in NAT HLA airspace until corrective actions have been taken which verify support of NAT HLA operations; and			
	(h) Is the aircraft airworthy for NAT HLA compliance.			
C.	**Flight Planning**			
10.	Are the following items addressed during demonstration?			
	a) Communications, navigation, and surveillance flight plan codes and planning documents.			
	b) Oceanic documents.			
	c) Plotting/orientation chart—plot route coast out to coast in.			
	d) Equal time points (ETP)—plot.			
	e) Track message (current copy available for all crossings). **Note:** Note nearest tracks on plotting/orientation chart.			
	f) Weather analysis—note en route temperature and turbulence forecasts as well as ETP airport weather.			
	g) Review suitable navigation aids (NAVAID) for accuracy check prior to coast out.			
D.	**Preflight**			
11.	Are the following items addressed during the demonstration flight?			
	a) Master clock for all ETA)/(ATA).			
	b) Maintenance log—check for any communications, navigation, & surveillance or RVSM issues.			
	c) RVSM.			
	d) Altimeter checks (tolerance).			

	e) Wind shear or turbulence forecast.			
	f) Flight plan (check routing, fuel load, times, groundspeeds).			
	g) Dual long-range navigation system (LRNS) for oceanic and remote continental airspace operations			
	h) High frequency (HF) check (including Selective Calling (SELCAL)).			
	i) Confirm present position coordinates (best source).			
	j) Master document symbols			
	k) LRNS programming: i) Check navigation database currency and software version. ii) Independently verify flight management system (FMS) programming. iii) Check expanded coordinates of oceanic waypoints. iv) Check course and distance (± 2° and ±2 nautical miles (NM)). v) Upload winds, if applicable.			
	l) Groundspeed check.			
12.	**Taxi and Prior to Takeoff**			
	a) Groundspeed check.			
	b) Present position check.			
13.	**Taxi and Prior to Takeoff**			
	c) Groundspeed check.			
	d) Present position check.			
14.	**Climb Out**			
	a) Transition altitude—set altimeters to 29.92 inches (1013.2 hectopascals).			
	b) Manually compute ETAs as duties permit.			
15.	**Prior to Oceanic Entry**			
	a) Navigation accuracy check—record results on master document.			
	b) HF check, if not done during preflight.			
	c) Confirm satellite communication (SATCOM) data link is operational, if equipped.			
	d) Log on to Controller-Pilot Data Link Communication (CPDLC) and Automatic Dependent Surveillance-Contract (ADS-C) 10 to 25 minutes prior, if equipped.			
	e) Verify your Required Navigation Performance (RNP) value.			

	f) Obtain oceanic clearance from appropriate clearance delivery and verify/cross-check air traffic control (ATC) route clearance is properly programmed into the LRNS. i) Confirm assigned oceanic flight level (FL) and request climb or descent to be at your assigned FL prior to oceanic airspace boundary. ii) Confirm FL, Mach, and route for crossing. iii) Advise ATC when able higher.			
	g) Re-clearance—update LRNS, master document, and plotting/orientation chart. **Note:** Check course and distance for new route.			
	h) Check altimeters—record readings on master document.			
	i) Compass heading check (inertial navigation system (INS))—record.			
16.	**After Oceanic Entry.**			
	a) Squawk 2000—30 minutes after entry, if applicable.			
	b) Maintain assigned Mach.			
	c) Maintain assigned FL.			
	d) VHF radios—set to air-to-air and guard frequency.			
	e) Strategic Lateral Offset Procedure (SLOP)—Depending on SOP, fly cleared route or up to 2 NM to the right of ATC-cleared track. Confirm procedures in the State AIP.			
	f) Altimeter checks—hourly.			
17.	**Approaching Waypoints**			
	a) Confirm coordinates of subsequent waypoints.			
	Note: Verify that the active FMS waypoint, as well as the next and subsequent ("next plus 1") waypoints, match your *currently effective route clearance*. Confirm that the *expanded* (i.e., full latitude and longitude coordinates) of the next and subsequent waypoints, as well as the course/heading and distance to the waypoints, agree with your currently effective route clearance.			
	b) Confirm lateral navigation (LNAV)/navigation (NAV) is engaged.			
18.	**Overhead Waypoints**			
	Confirm aircraft transitions to next waypoint. ***Note:*** *Check magnetic heading and distance against master document.*			
	Confirm time to next waypoint. ***Note:*** *ETA changes in excess of 2 minutes require ATC notification.*			

	Make position report. ***Note:*** *Record fuel remaining and current time on your master document.*			
19.	**Ten Minutes after Waypoint Passage**			
	Cross-check navigational performance and course compliance via one of the following methods: i) Plotting method ii) Navigation display method iii) Alternative method accepted by the Authority			
20.	**Midway Between Waypoints**			
	a) Cross-check winds between master document, LRNS, and winds aloft charts.			
	b) Confirm time to next waypoint.			
21.	**Coast In**			
	a) Remove strategic lateral offset prior to oceanic exit point.			
	b) Confirm routing beyond oceanic airspace.			
	c) Compare LRNS to ground-based NAVAID.			
	d) Transition level—set altimeters to barometric pressure for local altimeter setting (QNH).			
22.	**Destination/Block-In.**			
	Navigation accuracy check.			
E.	**APPROVAL AND CERTIFICATION**			

Inspector's Remarks

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Inspectors' Recommendation

We DO/DO NOT/RECOMMEND the aircraft for NAT HLA operation in accordance with applicable Civil Aviation Regulations and Technical Guidance Materials currently in force.

FOI .....Signature.....Date.....

AWI Inspector.....Signature.....Date.....

Approval

I hereby DO/DO NOT Approve aircraft for NAT HLA operation

Signature .....Date…….
Manager Flight Operations

APPENDIX II. EXPANDED NAT HLA OCEANIC CHECKLIST

FLIGHT PLANNING

a) Communications, Navigation, and Surveillance Flight Plan Codes and Planning Documents.

i) Review your ATC flight plan with emphasis on items 10A, 10B, and 18. Ensure that you properly filed the appropriate communications, navigation, and surveillance and Performance- based Navigation (PBN) descriptors in items 10 and 18 of your flight plan.

ii) You should review each aircraft's minimum equipment list (MEL) for system deferrals that may affect the communications, navigation, and surveillance capabilities of your aircraft. The "remarks and exceptions" column should provide the specific guidance for flight plan filing.

iii) You should ensure your operator's flight manual includes procedures to require flight plan amendments (or cancellations as appropriate) when your communications, navigation, and surveillance capabilities are changed during the preflight planning phase prior to departure.

Note: *Items 10 and 18 of the flight plan require more detail to indicate your communications, navigation, and surveillance capabilities and authorizations. These additional codes are necessary to meet performance-based requirements and are noted in ICAO Document 4444 Procedures for Air Navigation Services— Air Traffic Management (PANS-ATM) and in the U.S. Aeronautical Information Manual (AIM).*

b) Oceanic Documents

Operators are encouraged to develop a flight planning checklist to ensure they have the necessary documents before departure. The checklist should include, as a minimum, the following:

i) Master document.
ii) Notices to Airmen (NOTAM) for departure, destination, alternate(s); Extended Operations (ETOPS) alternates (as applicable); and oceanic Flight Information Regions (FIR).
iii) Weather for departure, destination, alternate airports along the route of flight, and ETOPS alternates (as applicable).
iv) Track message(s).
v) Significant weather (SIGWX) chart.
vi) ETP(s), wind tables, or winds aloft charts for FLs or altitudes.
vii) Global Positioning System (GPS) NOTAMs (as applicable); any applicable space weather watches, warnings, and alerts (Appendix C).
viii) Volcanic ash information.
ix) Pilot Weather Reports (PIREP).
x) Plotting charts.

c) Plotting/Orientation Chart.

You should use an oceanic plotting/orientation chart of appropriate scale that depicts published oceanic tracks.
ICAO groups that review oceanic errors have determined that the routine use of a chart is an excellent way to reduce lateral errors. A chart can also help in the event of partial or total navigation system failure. You should read from the plotting/orientation chart back to the master document when verifying data.

Reading from the master document to the chart can introduce "expectation bias," where errors are missed because we see what we expect to see.

Plot your *currently effective route clearance* from coast out to coast in. Make sure you update this (as applicable) whenever your route clearance changes. Note nearest oceanic tracks on your chart.

d) ETPs

You should compute ETPs for contingencies such as medical divert, engine loss, or rapid depressurization. You should also consider a simultaneous engine loss and rapid depressurization.

Verify that planned ETP airports are adequate during time of flight operations. You should annotate the ETPs and associated alternates on your plotting/orientation chart. When crossing ETPs, you should review with other crewmembers the appropriate diversion airport(s). Your pilot procedures should also include a manual method for computing ETPs. You should not enter ETPs in the active route of the LRNS because additional waypoints, even if along the route, can produce nuisance out-of-conformance alerts on ground-based monitoring systems. Also, crew misunderstanding about these additional waypoints has occasionally led to pilot deviations from the cleared route.

e) Track Message.

You must have a current track message even if you have filed for a random route or you filed above North Atlantic High Level Airspace (NAT HLA). Reviewing the date, effective time, and track message identifier ensures having a current track message on board. The track message identifier is linked to the Julian date. You should also ensure that your flight planning and operational control process requires notification of crewmembers of any amendments to the daily track message in a timely manner. When flying a random route, plotting adjacent tracks and/or crossing tracks can help your situational awareness in case you need to execute a contingency procedure.

f) Weather Analysis.

You should note en route temperature and turbulence forecasts, as well as ETP airport weather, diversion/emergency airport weather, volcanic activity, magnetic storms, and solar flares affecting your route of flight.

g) NAVAIDs

Review suitable NAVAIDs for accuracy check prior to coast out. You should determine in advance a primary and secondary ground-based NAVAID that you will use to verify the accuracy of your LRNS. This planning may help you identify intended NAVAIDs that are limited or NOTAM'd unusable and will help you when you depart airports close to oceanic airspace. A latitude/longitude radar fix from ATC also meets the requirements for an accuracy check.

PREFLIGHT

a) Master Clock

You must have an identified master clock on board synchronized to Coordinated Universal Time (UTC) (generally via GPS). You must use this single time source, typically the FMS, for all ETAs and ATAs.

b) Maintenance Log

You should focus, in particular, on any write-ups that affect communication, navigation, surveillance equipment, or RVSM requirements.

c) RVSM

Required equipment to operate in RVSM airspace includes two primary independent altimetry sources, one altitude alert system, and one automatic altitude control system. In most cases, you are also required to have a functioning transponder that can be linked to the primary altimetry source. You should note any maintenance issues that could affect accurate altimetry.

d) Altimeter Checks

Before taxi, you should set your altimeters to the airport QNH. Both primary altimeters must read within ± 75 feet of field elevation. The two primary altimeters must also agree with each other within the limits noted in the aircraft operating manual.

e) Wind Shear or Turbulence Forecast.

You should review the master document with the projected wind shear or the turbulence forecast documents for flights in RVSM airspace. Forecast severe turbulence could lead ATC to stop using certain FLs. Forecast severe turbulence may be incompatible with flight manual or company limitations.

f) Flight Plan

i) Ensure the flight plan designated as the master document includes the date, type aircraft, fuel load, and performance requirements.
ii) Cross-check the routing and forecast groundspeeds.
iii) Carefully check the master document against your filed flight plan to ensure both documents show the same routing.
iv) Check the en route time on the master document against the distance to your destination to ensure it is based on a reasonable groundspeed.
v) Compare the en route time against the total distance to ensure you have planned a reasonable fuel load.

g) LRNS

i) You are typically required to have two independent operational LRNSs for oceanic and remote continental airspace operations. Operations Specification (OpSpec)/Management Specification (MSpec)/Letter of Authorization (LOA) B054/MB054, Oceanic and Remote Airspace Navigation Using a Single Long-Range Navigation System, identifies the oceanic and remote continental areas authorized for operations with a single LRNS.
ii) A single FMS receiving inputs from two navigation sensors does not qualify as two LRNSs.

h) HF Check

i) You should conduct an HF check on the primary and secondary HF radios in areas where dual HF radios are required. (Two long-range communications systems are typically required for oceanic and remote continental airspace operations.)
ii) If possible, you should accomplish the HF checks on the ground or before entering oceanic airspace.
iii) Even if you are data link equipped, you should accomplish a SELCAL check at each oceanic control area boundary.

i) Confirm Present Position Coordinates.

i) Both pilots should independently verify the present position coordinates using either published ramp coordinates or by determining your position from the airfield diagram.
ii) You should not rely on the present position resident in your FMS from the previous flight.

j) Master Document Symbols.

You should use consistent symbology on your master document.

i) A circled number (④) may indicate the second crewmember has independently verified the coordinates entered or cross-checked by the first crewmember.
ii) A checkmark (✓) may indicate that the track and distances have been confirmed.
iii) A diagonal line (\) may indicate that the crew has confirmed the coordinates of the approaching and next waypoint.
iv) A second diagonal line creating an X symbol (X) may indicate waypoint passage.

k) LRNS Programming.

Check navigation database currency and software version.

i) You should not fly with an expired database.
ii) Your MEL may allow relief to fly with an expired database but require you to manually cross-check all data.
iii) You should also confirm the software version of the database, to ensure the correct version is loaded.

Independently verify FMS programming.

i) Two pilots should independently coordinate the loading and verification of flight plan entries.
ii) Prior to loading the route, carefully cross-check the waypoint routing on your master document against your filed ICAO flight to verify they are consistent.
iii) One pilot should load the route with all waypoints using the master document. That same pilot should verify the route has been loaded correctly. Use a means independent of the data you loaded, such as checking the course/distance between waypoints against the master document.
iv) A second pilot should independently check the entries by recalling and confirming the waypoint data against source information. This cross-check should include comparing the waypoints loaded in the FMS against both your filed flight plan and the master document. Cross-checking course and distance against the master document will further confirm the waypoints were loaded correctly.
v) The pilot accomplishing the cross-check should read from the FMS screen back to the master document when verifying data.

Note: *Reading from the master document to the FMS can introduce "expectation bias" where errors are missed because we see what we expect to see.*

Check waypoint expanded coordinates (degrees and minutes).

i) Most FMSs allow entering abbreviated oceanic coordinates. There have been cases when there was an error in the minutes, but crews only checked the 7-character display label, or the alphanumeric-character waypoint name, neither of which displays minutes.
ii) If you only verify the abbreviated coordinates, this could lead to a lateral error. You should check the expanded (i.e., degrees and minutes) coordinates of all oceanic waypoints.

Check course and distance.

i) To minimize oceanic errors, you should check magnetic course and distance between waypoints from oceanic entry to oceanic exit. You should establish a tolerance such as ± 2° and ± 2 NM.
ii) The course and distance checks comparing the master document against the LRNS are critical in detecting errors that you may not have noticed by simply checking coordinates.
iii) A discrepancy of more than 2° between the course in the master document and that in the LRNS may be caused by incompatible magnetic variation applied in the master document. An LRNS applies the magnetic variation at the present position to display magnetic course, whereas magnetic courses listed in the master document can be based on initial, mid-leg, or average leg magnetic variation. Given that course and distance checks are done on initial rollout, master documents should list courses based on the initial magnetic variation to ensure validity of this check. You should recheck and verify any difference outside the ± 2° or ± 2 NM tolerance.
iv) You should also refer to a master source such as an en route chart to confirm the accuracy of coordinates at the oceanic boundaries.
v) Confirm that total distance computed by the LRNS is consistent with your master document.
vi) If your navigation system waypoint sequencing is limited, number the master document waypoints. Use the same numbering sequence for all navigation systems in use.
vii) Upload winds -Some LRNS units allow the crew to upload projected winds. This procedure allows more accurate reporting of ETA.

l) Groundspeed check

You should note the groundspeed before taxiing the aircraft. You should expect the groundspeed to read zero knots.

Note: *This procedure is a good practice to detect an error that may be developing in the LRNS.*

TAXI AND PRIOR TO TAKEOFF

a) Groundspeed Check

During taxi to the active runway, pilots should again check the groundspeed to see if it is reasonable.

b) Present Position Check

You should also conduct a present position check after leaving the gate. Check for a gross difference between this present position and your gate coordinates. This check may alert you to a possible error in the LRNS database that you can investigate/correct prior to takeoff.

CLIMBOUT

a) Transition Altitude.

i) You should brief the transition altitude published on the departure or approach charts, or provided via automated terminal information service (ATIS).
ii) After climbing through the transition altitude, you should reset the altimeters to 29.92 inches or 1013.2 hectopascals.

b) Manually Compute ETAs.

If the departure airport is near the oceanic entry point, you should manually compute your ETAs from departure to destination, time and duties permitting, during climb out, or otherwise prior to oceanic entry. You should note these ETAs on the master document.

Note: *This is an excellent cross-check of ETAs computed by your LRNS.*

PRIOR TO OCEANIC ENTRY.

a) Navigation Accuracy Check.

Before oceanic entry, you should check the accuracy of your LRNS against a suitable ground-based NAVAID, as applicable. A latitude/longitude radar fix from ATC can also support a navigation accuracy check in lieu of a NAVAID. You should record the results of the accuracy check on the master document, with the time and position.

i) A large difference between the ground-based NAVAID and your LRNS, such that the ability to navigate with the accuracy required by ATC is questionable, requires immediate action, to include notification of ATC prior to entry into oceanic airspace.

Note: *Crews should not attempt to correct an error by performing an air alignment or by manually updating the position of the LRNS, because this has often resulted in worsening the problem.*

ii) You should establish a navigation accuracy check tolerance based on your type of LRNS. Rank each navigation system by accuracy if applicable.

iii) Record aircraft compass/inertial/radio magnetic indicator (RMI) headings and note differences and deviations. A compass deviation check is particularly important if your aircraft is not equipped with an FMS.

Select the most accurate navigation system for autocoupling as appropriate.

b) HF Checks

i) If you were unable to accomplish the HF checks on the ground, you should accomplish these checks before oceanic entry.

ii) Accomplish a SELCAL check prior to oceanic and remote continental airspace entry and then again at each control area boundary.
Check your SELCAL even when your CPDLC is working normally.

c) SATCOM Data Link Check.

If you plan on using SATCOM data link, you should check that your SATCOM data link is operational before oceanic entry.

d) Log on to CPDLC and/or ADS-C.

If you are approved to use CPDLC and/or ADS-C, you should log on to the appropriate data authority 10 to 25 minutes prior to the boundary.

e) Verify Your RNP Value.

Verify that the RNP value set in your flight management computer (FMC) is no higher than that required for the route of flight and reflects the RNP capability you indicated in your flight plan. For example, if you filed indicating RNP 4 capability, you should set an RNP value of 4.0 even though the route may only require RNP 10.

f) Obtain Oceanic Clearance.

At least two pilots should be involved in the clearance receipt and read-back process, one actively and one monitoring. When obtaining the clearance via radio, we recommend both pilots wear headsets because errors have resulted from loudspeaker distortion.

> ***Note:*** *Consult the AIP for the oceanic airspace FIR you are transiting to determine how and when to obtain your oceanic clearance. Timing differs depending on whether you receive your clearance via voice or data link.*

You should include your requested FL in your initial clearance request.

> ***Note:*** *Some oceanic centers, such as New York, request that pilots advise them at the time of their oceanic clearance "when able higher."*

Both pilots should independently copy the clearance. Each pilot then cross-checks and verifies with the other pilot the routing, FL, and Mach number assigned for the crossing. If there are any differences, contact the ATS provider for clarification. Read all waypoint coordinates back to the ATS provider in detail. Ensure the ATS provider acknowledges your correct read back. Always cross-check each detail of the clearance with your master document. It is important that both pilots confirm and ensure the aircraft enters the oceanic airspace at the altitude assigned in the oceanic clearance (this may be different than the domestic cleared FL). Request climb or descent, as required, in circular to be at your cleared oceanic FL prior to entering oceanic airspace.

Verify/cross-check route clearance is properly programmed into LRNS.

g) Re-clearance.

The number one scenario that leads to a pilot deviation from the assigned routing is a re-clearance (that is different from the oceanic route requested with the filed flight plan). You should be particularly cautious when receiving a re-clearance. Both pilots should separately copy and confirm the new routing, comparing with each other and confirming any inconsistencies with the ATS provider.

One pilot reprograms (and executes) your LRNS and updates the master document and plotting/orientation chart, crossing out the old waypoints and plotted route and replacing them with the updated information. A second pilot cross-checks the *newly effective route clearance* with the reprogrammed route in the FMS (checking the expanded coordinates: degrees and minutes), the updated master document, and the updated chart.

You should check the magnetic course and distance between the new waypoints. To update the master document course and distance, use commercially available tables, or obtain from dispatch an updated master document. It is also possible to use an onboard flight planning system to independently calculate course and distance, and check that against the FMS. Thoroughly brief all relief pilots on the new clearance prior to them assuming cockpit duties. We highly recommend the relief pilots also independently cross-check the *currently effective route clearance* against the FMS, master document, and chart.

h) Altimeter Checks

Prior to oceanic entry, you must check the two primary altimeters are reading within 200 feet of each other (or lesser value if specified in your aircraft operating manual). Conduct this check while at level flight. You should also note the stand-by altimeter reading. Record the altimeter readings along with the

time on the master document.

i) Compass Heading Check (INS).

If inertial systems are your only means of long-range navigation, we recommend you conduct a compass heading check and record the results. If a problem develops over water, this check can also aid you in determining the most accurate compass.

AFTER OCEANIC ENTRY

a) Squawk 2000

i) Thirty minutes after oceanic entry, you should change your squawk to 2000, if applicable.
ii) There may be regional differences. For example, aircraft flying within the West Atlantic Route System (WATRS) or transiting the Reykjavik Oceanic Control Area are expected to maintain the last assigned squawk.

b) Maintain Assigned Mach.

Some oceanic clearances include a specific Mach. ATC requires you to maintain these speeds precisely.

i) The increased emphasis on longitudinal separation requires increased crew vigilance, as Air Traffic Service (ATS) providers base that separation on your aircraft maintaining that assigned Mach.
ii) Controllers will assign a true Mach. In most cases, the true Mach is the indicated Mach. Some aircraft may require a correction factor.

Note: *Crews must ensure they fly the assigned Mach vice Economy (ECON) or Long Range Cruise.*

c) Maintain Assigned FL

You must report to ATC when departing your current FL.

d) **VHF Radios**

After going beyond the range of the assigned VHF frequency, you should set your radios to air-to-air (123.45) and guard frequency (121.5).

e) SLOP

Your SOPs should include SLOP for all oceanic crossings. NOTAMs, State AIPs, and other flight planning guidance will indicate where exceptions apply and where procedures differ. This procedure was developed to reduce the risk associated with an altitude deviation and two highly accurate navigation systems navigating to the same point. SLOP also replaced the contingency procedure developed for aircraft encountering wake turbulence. Depending upon winds aloft, coordination between aircraft to avoid wake turbulence may be necessary. This procedure, which distributes traffic between the route centerline and up to 2 NM right of centerline, greatly reduces risk by the nature of its randomness.

i) Operators that have an automatic offset capability should fly up to 2 NM right of the centerline.
ii) Aircraft that do not have an automatic offset capability (that can be programmed in the LRNS) should fly the centerline only.

f) Hourly Altimeter Checks.

The two primary altimeters should continue to read within 200 feet of each other (or lesser value if specified in your aircraft operating manual).

Note: *We recommend that you record these hourly checks on the master document with the readings and times. This information can help you determine the most accurate altimeter if you develop an altimetry problem.* Routine Monitoring.

i) Specify which FMS pages, or other monitorable elements of your navigation system, that specific flightcrew members are charged with monitoring (e.g., cross-track error or time/distance).

ii) The nonsteering navigation system should be used to display cross-track error and track angle error, if available.

iii) If your FMS provides a predicted ETA capability, you should take full advantage of that function in circular to track the accuracy of ETAs and provide reminders for performing the "approaching waypoint" and "10 minutes following waypoint passage" cross-checking procedures.

APPROACHING WAYPOINTS

a) Confirm coordinates of subsequent waypoints

Within a few minutes prior to crossing an oceanic waypoint, you should confirm the expanded coordinates of the next and subsequent ("next + 1") oceanic waypoints.

You should accomplish this check by comparing the coordinates in your FMS against your master document (as updated based on your *currently effective route clearance*), as well as verifying that the course/heading and distance in the FMS matches your master document.

Draw a diagonal through the waypoint on your master document.

b) Confirm your autopilot steering is appropriately engaged (LNAV/NAV).

OVERHEAD WAYPOINTS

a) **Confirm aircraft transitions to the next waypoint**.

1. When overhead an oceanic waypoint, you should ensure that your aircraft properly transitions to the next leg.

Note: You can confirm this by noting the magnetic heading and distance to the next waypoint as compared against the master document (as updated based on your currently effective route clearance).

b) Confirm time to next waypoint.

Note: ETA changes in excess of 2 minutes require ATC notification

c) Position report:

2. Use the standard format for voice position reports to ATC.
3. You should also note and record your fuel status on the master document at each oceanic waypoint.

Note 1: *This is especially important if the cleared route and FL differ significantly from the filed flight plan.*

Note 2: *In 2010, ICAO eliminated the requirement to report weather data via voice reports.*

TEN MINUTES AFTER WAYPOINT PASSAGE.

Cross-check navigational performance and course compliance by one of the following methods: The "plotting" method is appropriate for all aircraft navigation configurations.

i) Verify your plotting/orientation chart reflects the *currently effective route clearance.*
ii) Plot your present latitude/longitude and record the time on your chart.
iii) You should plot your position using coordinates from the nonsteering LRNS.
iv) Investigate/take corrective action if your plotted position does not agree with your *currently effective route clearance*.
v) Using the steering LRNS, verify the next waypoint is consistent with the *currently effective route clearance*.
vi) Verify your autopilot steering mode is in LNAV/VNAV or other appropriate mode to ensure steering to the next intended waypoint.

The "navigation display" method is appropriate for and available for use in aircraft equipped with an operable FMS:

i) Confirm the aircraft symbol is on the programmed route on the navigation display (at smallest scale).
ii) Check system-generated cross-track deviation or similar indication of any deviation from the programmed route of flight.
iii) Using the steering LRNS verify the "TO" waypoint is consistent with your *currently effective route clearance*.
iv) Investigate/take correction action to address any anomalies or unexpected deviations.
v) Verify your autopilot steering mode is LNAV/VNAV or other appropriate mode to ensure steering to the next intended waypoint.
vi) An alternate method may be used with the Authority acceptance.

MIDWAY BETWEEN WAYPOINTS.

a) Cross-Check Winds.

We recommend you cross-check the winds midway between oceanic waypoints by comparing the master document, LRNS, and winds aloft chart. This cross-check will also assist with situational awareness and in the event your navigation capability is degraded to the point where you need to dead reckon (DR).

b) **Confirm ETA.**

We recommend you confirm your ETA to the next waypoint.

Note: *Revise your ETA with ATC in a timely manner if it has changed greater than 2 minutes.*

COAST-IN

a) Remove strategic lateral offset.

You must remove the strategic lateral offset prior to exiting oceanic airspace at coast-in. We recommend you include this as a checklist item.

b) Confirm routing beyond oceanic airspace.

Before entering the domestic route structure, you must confirm your routing and speed assignment.

Note: *Crews experiencing loss of communication leaving oceanic airspace should follow guidance published in the applicable State AIP.*

c) **Compare LRNS to ground-based NAVAID** (as applicable depending on your equipage).

i) When departing oceanic airspace and acquiring ground-based NAVAIDs, you should note the accuracy of your LRNS compared to the position information provided by those NAVAIDs.
ii) You should note discrepancies in your maintenance log.

DESCENT

Transition Level

During the approach briefing, you should note the transition level on the approach plate or verify with ATC. You must reset your altimeters to QNH when descending through the transition level. You should confirm whether the altimeter setting is based on inches of mercury or hectopascals.

DESTINATION/BLOCK-IN

Navigation Accuracy Check

When arriving at your destination gate, you should note any drift or circular error in your LRNS.

i) A GPS primary means system normally should not exceed 0.27 NM for the flight.
ii) Some inertial systems may drift as much as 2 NM per hour.

Note: *If tolerances are exceeded, make an appropriate entry in the maintenance log.*

RVSM WRITE-UPS

You must note problems in the altimetry system, altitude alert, or altitude hold in the maintenance log.

Note: *ATS authorities closely monitor RVSM airspace for any Large Height Deviations (LHD). If your aircraft no longer meets RVSM standards, you must not flight plan into RVSM airspace.*

APPENDIX IV AREAS OF MAGNETIC UNRELIABILITY

1.0 AREAS OF MAGNETIC UNRELIABILITY (AMU)

1.1 Conventional magnetic compasses sense magnetic direction by detecting the horizontal component of the earth's magnetic field. Since this horizontal component vanishes near the magnetic poles, magnetic compasses are highly unreliable and unusable in an area approximately 1,000 NM from each magnetic pole.

1.2 Within these areas, air navigation tasks are further complicated by very rapid changes in magnetic variation over small distances. For example, when flying between the magnetic North Pole and the true North Pole, a heading of true North results in a magnetic heading of South (a magnetic variation of 180 degrees).

2.0 CONVERGENCE OF THE MERIDIANS

2.1 Since these two major AMUs also occur near the earth's geographic poles, the convergence of the meridians also presents additional directional complications. When flying "great circle" courses at latitudes greater than 67 degrees, convergence of the meridians can create rapid changes in true headings and true courses with small changes in aircraft position. Relative small errors in determining the aircraft actual position can produce very large errors and maintain the assigned flight path.

a) An extreme example of this phenomenon occurs at the earth's geographic North Pole. Flight in any direction from the exact pole is initially due south. (That is, the direction to Russia or the United States is south).

2.2 Operations within these areas can only be conducted safely if the primary heading reference is derived from sources other than magnetic.

3.0 SPECIAL EQUIPMENT, TECHNIQUES, AND/OR PROCEDURES

3.1 Special navigation equipment, techniques, and/or procedures are critical to operate safely in polar areas, including the two AMUs.

3.2 Operations based solely on magnetic references within AMUs are unsafe, unacceptable and shall not be approved.

3.3 All INS/IRS/IRU are capable of calculating true North independently from other aircraft systems. INS/IRS/ IRU can be approved and safely used for operations in AMUs and polar areas provided the following conditions are met—

a) The INS is certified as airworthy for the highest latitude authorized for these operations.

b) Ground alignment of the INS/IRS/IRU is restricted to those airports where satisfactory alignment has been demonstrated or otherwise approved.

c) The operator's training programs and crew procedures provide acceptable techniques and methods for the following—

i) Approaches and departures using appropriate heading references other than magnetic.

ii) The use of ground-based NAVAIDs, which are oriented to appropriate directional references other than magnetic

3.4 There is a wide variety of other methods, systems, techniques, and procedures that can be used for navigation in AMUs and polar areas.

3.5 However, due to the variety of means and the complexity of air navigation in these areas, specific direction and guidance for these other means of navigation are not provided in this manual.

4.0 BOUNDARIES OF THE AMU

4.1 For the northern hemisphere, the **Canadian AIP** establishes the basic boundaries for the AMU. Canadian Air Navigation Order, current edition, states that no person may operate an aircraft in instrument flight rules (IFR) flight.

4.2 Within Canadian northern domestic airspace unless it is equipped with a means of establishing direction that is not dependent on a magnetic source. The special equipment, training, and procedures discussed in this paragraph are required for all operations into the area of northern domestic airspace.

4.3 This area is also outlined on Canadian en route charts. For the purposes of this paragraph, northern domestic airspace is considered to extend from ground level to infinity.

5.0 APPROVALS FOR AMU

5.1 The applicant shall submit to the Authority the appropriate manuals, checklists and SOPs for Operations in the AMU for review and approval.

5.2 Inspectors must not approve operations in AMUs without the participation and concurrence of an inspector with special training regarding navigation methods for these areas.

5.3 Inspectors must obtain assistance from an inspector with special navigation qualification when evaluating and approving or denying an operator's request to use systems, techniques, or procedures that are not discussed in this Circular.

6.0 TRAINING REQUIREMENTS

6.1 The applicant shall submit a training curriculum to be approved by the Authority.