

Next Generation Aviation Professional (NGAP) Aviation Industry Jobs & STEM (AIJ-STEM) Outreach Programme

Gimhan Dabarera

Secretary, NGAP Sri Lanka Programme

NGAP National Coordinator

Civil Aviation Authority of Sri Lanka (CAASL)

No 4. Hunupitya Cross Road, Colombo 00200, Western Province, Sri Lanka

seccaa@caa.lk or dabarera.srilanka@gmail.com

+94-77-666-7976

Table of Contents

Contents

| | |
|---|----|
| 1. Background | 4 |
| 2. The Approach Overview:..... | 5 |
| Team Composition: | 6 |
| Skit & Team Member Matrix: | 6 |
| 3. The Competition: | 9 |
| National Competition:..... | 10 |
| ICAO Regional Competition: | 11 |
| ICAO Global Competition:..... | 11 |
| 4. Implementation: | 12 |
| Program Definition Coordination Committee (PDCC): | 12 |
| Programme Execution Coordination Committee (PECC):..... | 14 |
| 5. Approach Details:..... | 16 |
| 1.1 Security Check..... | 16 |
| 1.3 Departure Lounge | 16 |
| 1.4 Cabin Seating..... | 16 |
| 1.5 Safety Briefing | 16 |
| 2.1 Pre-Flight Maintenance Check | 16 |
| 2.2 Flight Dispatch..... | 16 |
| 2.3 Pre-Flight Checklist..... | 16 |
| 2.4 Taxi to Runway..... | 16 |
| 2.5 Take Off..... | 16 |
| 2.6 Air Traffic Control During Pylon Course | 16 |
| 2.7 Land..... | 16 |
| 2.8 Taxi back to Gate..... | 16 |
| 2.9 Post-Flight Hand Off to Maintenance | 17 |
| Annex 1.1 – Security Check..... | 18 |
| Annex 1.2 Passenger Check In | 20 |
| Annex 1.3 Departure Lounge | 21 |
| Annex 1.4 Cabin Seating | 22 |
| Annex 1.5 Safety Briefing..... | 23 |

Annex 2.1 Pre-Flight Maintenance Check 24

Annex 2.2 Flight Dispatch 25

Annex 2.3 Pre-Flight Checklist 26

Annex 2.4 Taxi to Runway 27

Annex 2.5 Take Off 28

Annex 2.6 Air Traffic Control During Pylon Course 29

Annex 2.7 Land 30

Annex 2.8 Taxi back to Gate 31

Annex 2.9 Post-Flight Hand Off to Maintenance 32

It has been recognized by the international aviation community that there will be an anticipated shortage of skilled aviation professionals in the near future. In order to address this important issue, ICAO launched the Next Generation of Aviation Professionals (NGAP) initiative to ensure that enough qualified and competent aviation professionals are available to operate, manage and maintain the future international air transport system.

- ICAO NGAP

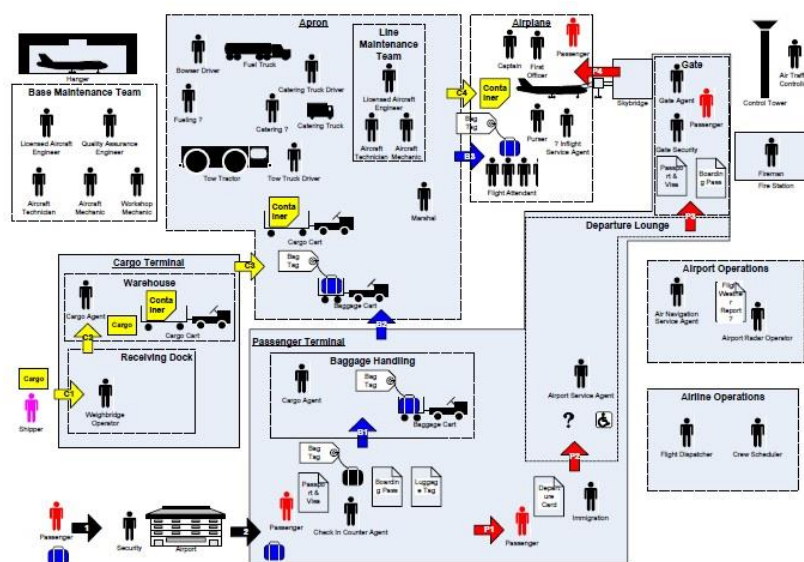
1. Background

In response to ICAO’s call to ensure the availability of aviation professionals to handle the dramatic growth in air travel that will take place over the next 20 years, it is proposed that a world-wide, annual competition be conducted with Grade 8/9 (age 14) school children to attract them to the field of aviation and to make them more STEM literate. The proposed Programme, AIJ-STEM (pronounced “Age Stem”) Outreach is intended to involve millions of students in the 191 ICAO Member States at end point after piloting it in a few states. Potentially more importantly, it will make the parents aware of the opportunities leading them to encourage their children to jobs in the aviation industry and STEM.

Even though 3.5 billion passengers were carried by the airlines in 2015, it is estimated that 6-7 billion of the world’s population have never been on an airplane. The competition will expose children from all walks of life to aviation related jobs via a series of short skits, and to STEM (Science, Technology, Engineering and Mathematics) via the building and flying a standard model airplane kit.

Only a subset of the gamut of aviation operations jobs (shown in Figure 1 below) will be covered, due to time limitations.

Figure 1 - Airport Operations & Professions

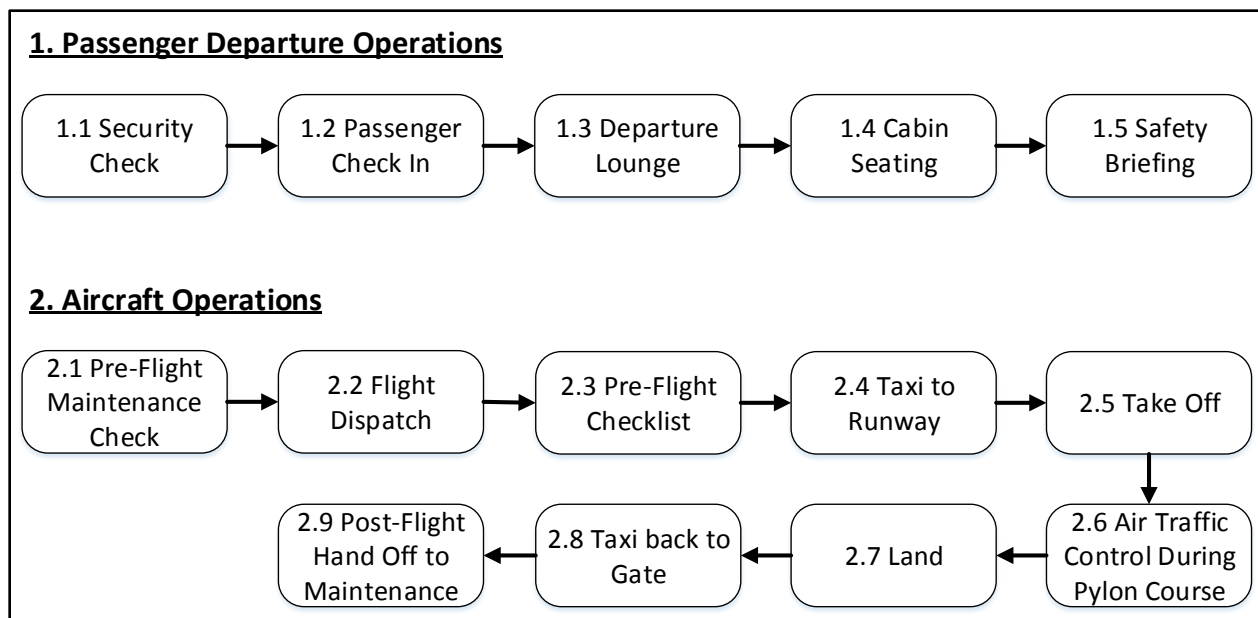


2. The Approach Overview:

The proposed approach is to create an AIJ-STEM competition which will demonstrate aviation related jobs via a series of skits, and to expose the students to STEM via the building and flying of a standard model airplane.

The skits will be conducted in English, the universal language of aviation and STEM. Since all the students may not be English literate, the instruction manuals for the competition and the “training” will be in localized languages. The script that will be used in the skits will be spoken in English, so local language translation and a phonetic pronunciation guide will be provided to ensure that students who are not fluent in English may also participate.

Passenger departure operations from security check-in to cabin seating will be shown on the passenger side. The model airplane will be used to demonstrate airline, airport and air traffic control (ATC) operations from maintenance release, to flight dispatch, to take off, flight, and landing around a pylon course.



Team Composition:

The team will consist of 16 students (equal gender representation from co-educational schools), who will be assigned the following roles. The students will be encouraged to cross-train in as many roles as possible to learn the passenger as well as the aircraft operations side of the aviation industry and to be exposed to STEM via the model airplane building and flying.

| # | Role | Quantity | Remarks |
|----|------------------------|----------|---|
| 1 | Security Officer | 2 | |
| 2 | Check In Officer | 2 | |
| 3 | Departure Gate Officer | 1 | |
| 4 | Cabin Crew | 3 | |
| 5 | Flight Dispatcher | 1 | |
| 6 | Maintenance Engineer | 1 | |
| 7 | Fire/Rescue Crew | 1 | |
| 8 | Cockpit Crew | 2 | |
| 9 | Control Tower Crew | 2 | Ground Control (taxi from gate to runway and back), and Local Control (take-off to landing) |
| 10 | Air Traffic Control | 1 | Terminal Control Area (TCA) to pylon course |

All participating students must obtain their parents signature on an authorization form acknowledging that student will have to dedicate time to prepare for and participate in the competition. The form also indicates that the student may have to travel locally and internationally for multiple days under the supervision of their school's AIJ-STEM Teacher-In-Charge.

The cost of materials for the model airplane and travel will be covered by sponsors and donations.

Skit & Team Member Matrix:

The competition will be based on 14 short skits that will be scored by two sets of judges. The first 5 skits concern passenger operations, and the second 9 skits concern aircraft operations with a separate team of judges for each of those operations areas. The judging will be based on team's capability to execute a standard set of tasks during each skit per their prior training. The judges will be given standard scoring sheets, which may be in the local language. The majority of the judging criteria will be objective as mentioned above, but team attitude and spirit will also be rated.

For the passenger operations skits, it is proposed that another team at the competition, or even audience members, play the role of the 10 passengers.

The table below shows the role(s) that participate in a skit, the functions performed and the duration for each skit. The total flow time is about 15 minutes per team. However, the two operations areas can potentially be run in parallel reducing the flow time per team to about 8 minutes. The primary reason for minimizing the flow time per team is to have as many teams as possible participate during a single school day session.

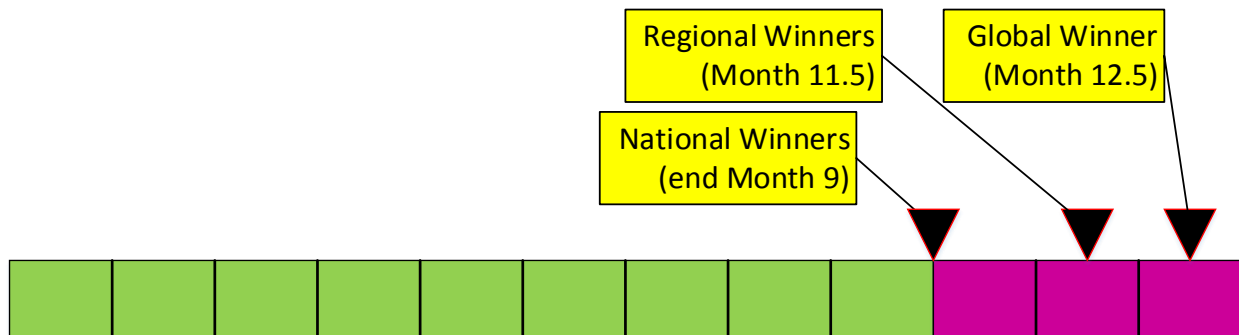
Allowing for set up time in between teams, potentially 3-4 teams per hour for the serial approach, or 4-5 teams per hour for the parallel approach could be achieved.

| Skit Name | Role (quantity) | Function Performed | Duration (minutes) | Elapsed Time at end (minutes) |
|----------------------------------|--|---|----------------------------|--------------------------------------|
| 1.1 Security Check | Security Officer (2) | Check for prohibited materials | 1.5 (15 sec per passenger) | 1.5 |
| 1.2 Passenger Check In | Check In Officer (2) | Check validity of travel documents, and issue boarding pass according to defined criteria | 1.5 (15 sec per passenger) | 3 |
| 1.3 Departure Lounge | Departure Gate Officer (1) | Request people to board per defined criteria | 2 | 5 |
| 1.4 Cabin Seating | Cabin Crew (3) | Seat passengers and stow luggage under seat | 1 | 6 |
| 1.5 Safety Briefing | Cabin Crew (3) | Brief passengers on seat belt, life jacket and exit locations | 2 | 8 |
| 2.1 Pre-Flight Maintenance Check | Maintenance Engineer, Fire/Rescue Crew | Check model airplane is operational, and release to operations | 0.5 | 8.5 |
| 2.2 Flight Dispatch | Flight Dispatcher | Advise Cockpit Crew of weather conditions and | 0.5 | 9 |

| | | | | |
|---|--|---|-----|------|
| | | assign runway | | |
| 2.3 Pre-Flight Checklist | Cockpit Crew | Co-pilot reads checklist, and pilot checks function on airplane | 0.5 | 9.5 |
| 2.4 Taxi to Runway | Cockpit Crew, Ground Control | Taxi from gate to runway | 0.5 | 10 |
| 2.5 Take Off | Cockpit Crew, Local Control | Take off | 0.5 | 10.5 |
| 2.6 Air Traffic Control During Pylon Course | Cockpit Crew, ATC | Fly around course | 2 | 12.5 |
| 2.7 Land | Cockpit Crew, Local Control | Land | 0.5 | 13 |
| 2.8 Taxi back to Gate | Cockpit Crew, Ground Control | Taxi from runway to gate | 0.5 | 13.5 |
| 2.9 Post-Flight Hand Off to Maintenance | Cockpit Crew, Maintenance Engineer, Fire/Rescue Crew | Check function, and power off airplane | 0.5 | 14 |

3. The Competition:

The competition should be piloted in a State or few States to begin with. The competition is to be held on an annual cycle ending with National winner by the end of Month 9. Once this Programme is piloted successfully in a State, or States and refined, then an ICAO Regional competition can be held at the middle of Month 11, and then the Global final at the middle on Month 12.

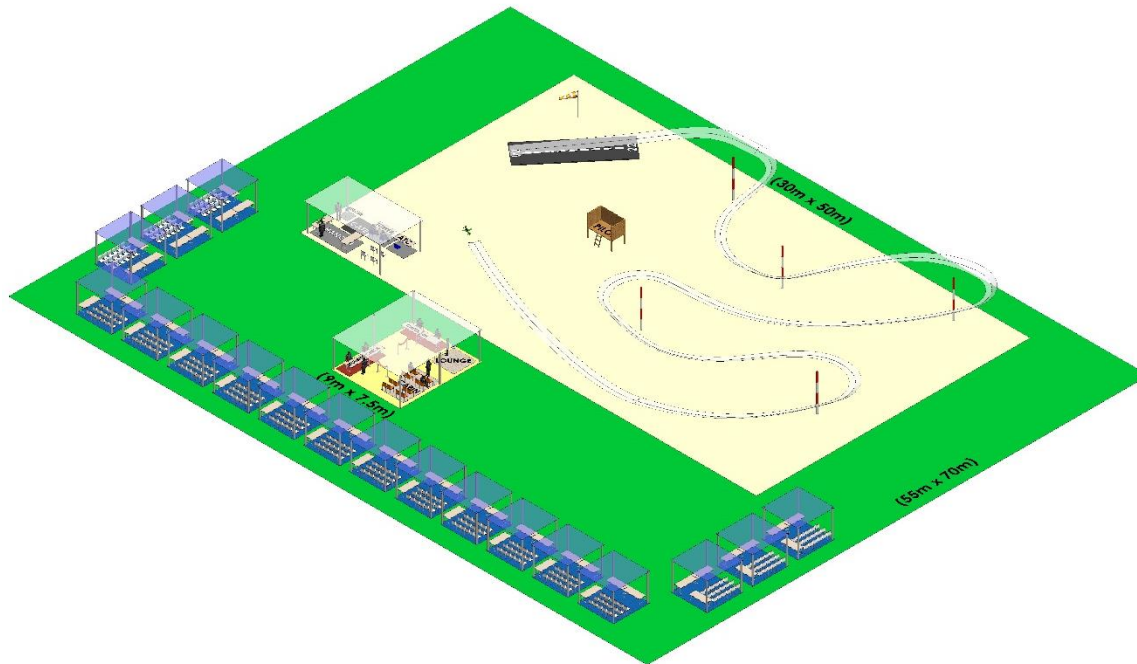


If a minimum thousand teams competed from each country at the National level—in Sri Lanka there are 10,000 schools up to Grade 10, so getting 10% of them to participate would be no problem—then a minimum of about 3 million students would be exposed to the aviation industry and STEM in just one year across the 191 member States once this is rolled out globally. We anticipate that the numbers will be much higher per year since this will be a highly engaging competition for students. The competition would be very appealing to the general public and media as well, so we anticipate wide popularity.

Whenever possible, it is proposed that the competition at any level be completed within half a day to minimize:

- Student time away from school
- Travel costs
- Event costs, and
- Volunteer judges and other event volunteer time away from work.

In order to achieve the above objective, at events with a large number of competing teams, more than one competition field may have to be set up.



Given that the number of countries in an ICAO Region varies widely, it is proposed that the following number of teams from each Region participate in the Global Competition for a total of 25 finalists.

| | Countries/ Region | Region Reps | Region Office Location |
|------------------------------|----------------------|----------------|---------------------------|
| Africa | 51 | 5 | Nairobi/Dakar |
| Asia-Pacific | 38 | 4 | Bangkok |
| Caribbean-South America | 51 | 5 | Mexico City |
| Europe | 60 | 6 | Paris |
| Middle East | 16 | 2 | Cairo |
| North America | 2 | 2 | Montreal |
| Total at Global Level | 218 | 24 | |

National Competition:

The National Competition will be a multi-Ministerial effort with Civil Aviation Authority in the lead and support from the Ministries of Education, Science & Technology, and Technical Vocational Education. It is acknowledged that many schools within a country may not participate for a variety of reasons.

The National Competition should be completed within 9 months of the start date, and each country will have to determine the administrative sub-divisions levels at which the competition

will take place internally. At the end of month 9, the national winning team's name will be submitted to the ICAO Regional Office.

It is proposed that the National Finals Competition be a grand event with full media coverage in order to maximize the benefit of NGAP outreach. There is also the potential for telemetering data from the model airplane during the model airplane flight similar to data feeds during car races. This will allow for a more engaging experience for the audience while imparting some STEM knowledge about g forces, airplane attitude, ground speed, wind speed etc.

ICAO Regional Competition:

The ICAO Regional Competition will take place at the country where the Regional Office is located. The Africa regional competition will alternate between the two region office locations. The regional competition may require 2-3 days in some of the ICAO Regions with a large number of states. Since International travel sponsorship will need to be organized for the National winners to attend the ICAO Regional Competition, it is proposed that it be held during the middle of month 11 to permit adequate time for fund raising.

International media coverage will maximize the benefits of NGAP outreach.

ICAO Global Competition:

The ICAO Global Competition can take place at a member state country selected via a Regional and then Global lottery process. As with the ICAO Regional Competition, since International travel sponsorship will be needed for the ICAO Region winners, it is proposed that it be held during the middle of month 12 to permit adequate time for fund raising.

International media coverage will maximize the benefits of NGAP outreach, and encourage additional schools at the local level to sign up for the next year's competition.

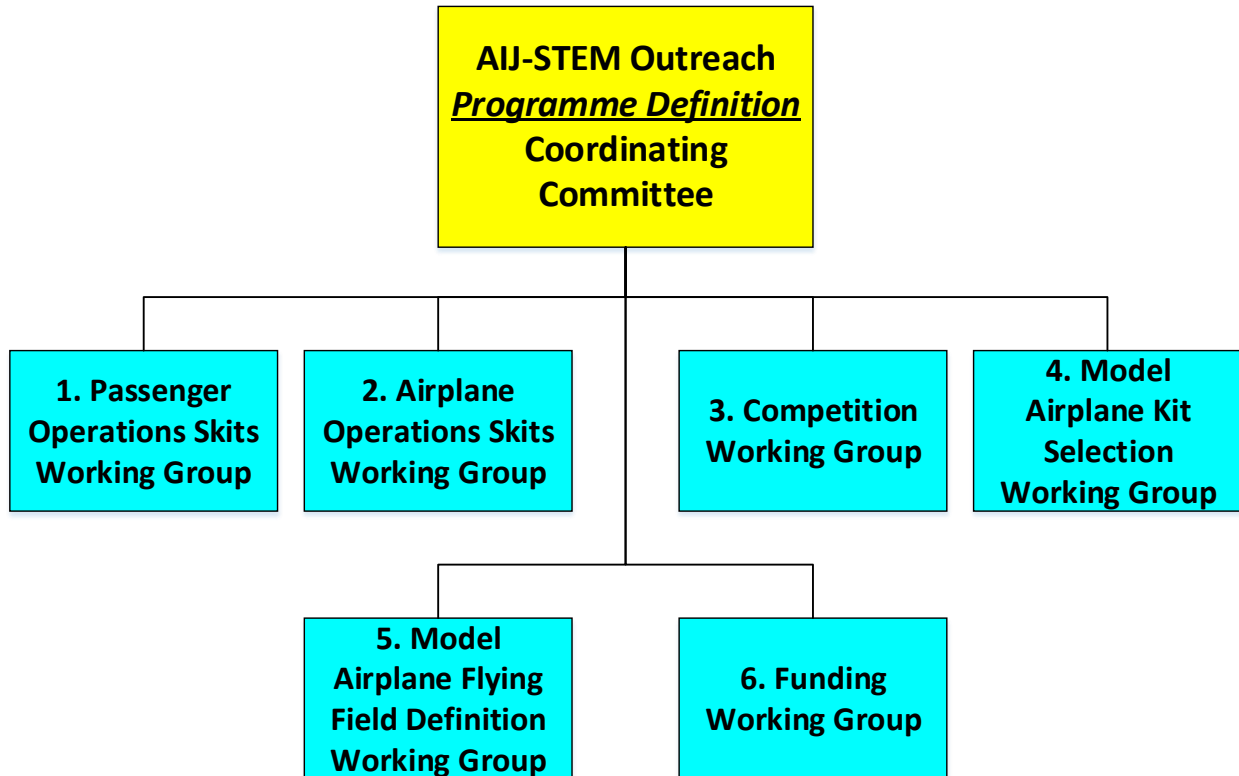
4. Implementation:

Once ICAO NGAP Outreach approves the AIJ-STEM Programme, a variety of committees will have to be set up as follows within the pilot States in 2 Phases.

The first phase will involve a Programme Definition Coordination Committee, and the second phase will involve a Programme Execution Coordination Committee.

Program Definition Coordination Committee (PDCC):

The PDCC will be set up as shown in the figure below.



It is proposed that a Programme Definition Coordinating Committee be formed with a CAA representative from the country and volunteers with experience in the aviation industry, model airplanes, theatre and STEM education. Since this Programme would involve students, a representative from the Ministry of Education and potentially even the Ministry of Vocational Education will also be part of the Coordinating Committee. A Ministry of Defense, and Ministry of Law Enforcement representatives will also be included to define and approve additional model airplane flying fields for students to test fly their airplanes.

Reporting to that Coordinating Committee will be a series of volunteer Working Groups drawn from the same fields mentioned to develop the materials for the Age-STEM Programme in English. The output of the Working Groups is proposed to be published on the local CAA NGAP

Outreach web site in English and other local languages as well. Please note however that the competition skits are proposed to be run in English since English is the universal language of aviation. It is proposed that the local CAA bear the cost of translation as part of their operational budget.

1. Passenger Operations Skits Working Group:

The volunteers for this group will be drawn from airlines (airport passenger departure operations side, cabin crew) and airport security personnel. Their mission is to develop all the detailed guidance material for the conduct of the passenger departure skits.

2. Airplane Operations Skits Working Group:

The volunteers for this group will be drawn from airline (maintenance engineering, cockpit crew), and airport (flight dispatch, tower, air traffic control, fire/rescue) personnel. Their mission is to develop all the detailed guidance material for the conduct of the airplane operations skits.

3. Competition Working Group:

The volunteers for this group will be drawn from the school system and Ministry of Education. will create a calendar so that competitions can start at the local level and be completed at the National level in 9 months taking into account the school district structures of that particular country.

They will also develop the layout for the competition, the judging criteria, the cost estimates for holding the events and transportation stipends for attendees etc. They will also be responsible for defining the PR plan for the events and coordinate with media.

4. Model Airplane Kit Selection Working Group:

The volunteers for this group will be drawn from the model airplane flying clubs and the CAA and will define components, materials, tools etc. for the model airplane kit. They will then call for informal tenders from the local hobby shops.

They will ensure the selected vendor has been in business in the State for a few years, and that they have the capability to provide the kits in the volumes required and to provide spares as needed by the teams.

5. Model Airplane Flying Field Definition Working Group:

The volunteers for this group will be drawn from the CAA, Ministry of Defense and Police Departments. All the schools that choose to participate will have to define a model airplane flying field in their area to learn to fly the model and to practice for the competition pylon course. This group will also define the safe operating practices and ensure that they are adhered to by training the Teacher-in-Charge (TIC) and the team members.

6. Funding Working Group:

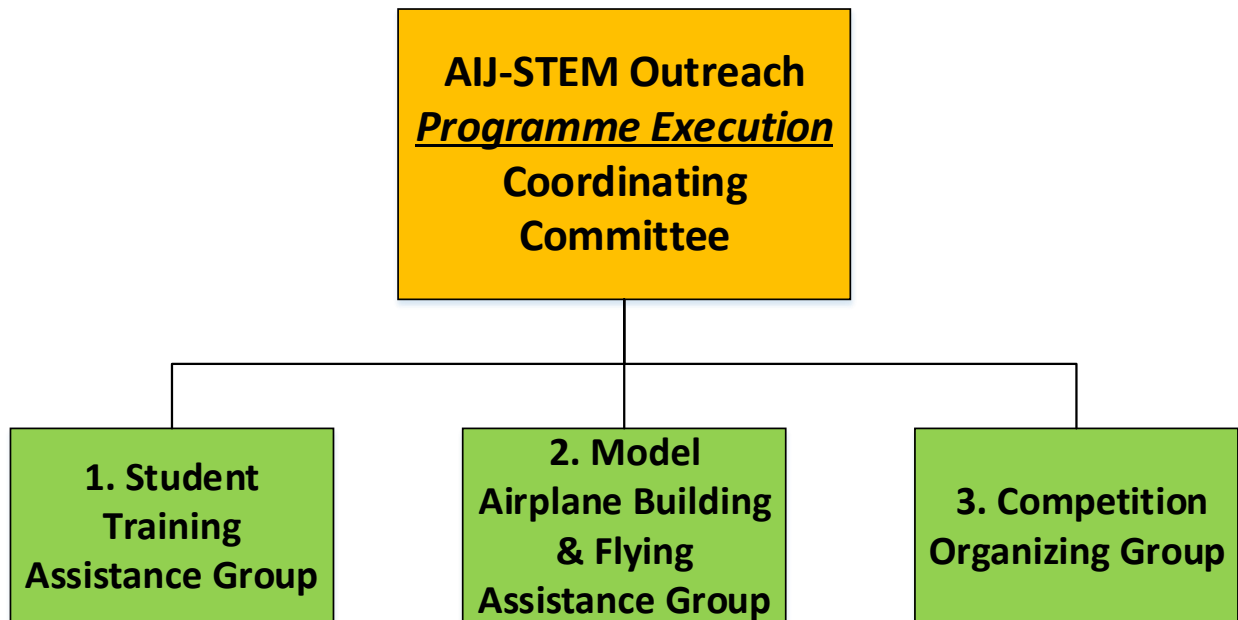
The volunteers for this group will be drawn from Corporate CSR departments, school alumni associations, local and international service organization (e.g. Rotary, Lions) etc. and the first order of business will be to create a not-for-profit entity for the future funds that will be raised.

They will coordinate with the other working groups to arrive at a detailed cost estimate for the State competition. They will also develop a high level estimate for the future Regional and Global competitions. This information will be used by them to start a fund raising campaign and will involve wide spread media publicity, potentially with an “example competition” video which highlights the many benefits at a team, school and national level of participating in such a competition.

Initial indications are that there will be no shortage of donors and sponsors who will come forward to fund the model airplane kit, event and team travel costs as part of their PR or CSR (Corporate Social Responsibility) Programme since the competition will address the serious issues of inclusive economic growth opportunities, especially for the rural poor. There is also a high level of enthusiasm amongst the service organizations and some discussions with alumni. Part of the appeal is the core idea of a competition where girls’ and boys’ teams will compete against each other.

Programme Execution Coordination Committee (PECC):

The PECC will be set up as shown in the figure below.



Similar to the previous team structure, we propose that the PECC be formed with State CAA, volunteer and Ministry participation.

The final piece of the puzzle is the competition organizing committee which will make the events happen per the planned calendar.

1. Student Training Assistance Group:

At the execution stage, students will need assistance with learning the skits, background materials, judging criteria and practicing the skits. It is proposed that these volunteer assistance groups be drawn from teachers, school alumni and members of the public who have been familiarized with the materials.

2. Model Airplane Building & Flying Assistance Group:

The volunteers for this group will be drawn from local model airplane flying club members or members of the general public who build and fly their own model airplanes. Since these building and flying skills may not be available widely in some states, it is proposed that short video clips be created by the model airplane kit vendor to assist students in the build stage. For the flying stage, a low cost computer flight simulator software and joystick may have to be included in the model airplane kit.

3. Competition Organizing Group:

The volunteers for this group will be drawn from the local school and general public where the competition will be held. They will organize the competition according to the guidelines developed by the PDCC, develop cost estimates, and request funding from the not-for-profit entity that has been set up.

Once the competition has been completed, they will provide a full accounting of the actual expenses, and provide a report on the winners, lessons learned etc. to the PECC.

5. Approach Details:

This section details out the various components of the competition skit by skit.

The details of what is required is shown in the various Annexes for ease of reading.

1.1 Security Check

Annex 1.1 shows the materials, processes, and sample script for the “Security Check” skit.

1.2 Passenger Check In

Annex 1.2 shows the materials, processes, and sample script for the “Passenger Check In” skit.

1.3 Departure Lounge

Annex 1.3 shows the materials, processes, and sample script for the “Departure Lounge” skit.

1.4 Cabin Seating

Annex 1.4 shows the materials, processes, and sample script for the “Cabin Seating” skit.

1.5 Safety Briefing

Annex 1.5 shows the materials, processes, and sample script for the “Safety Briefing” skit.

2.1 Pre-Flight Maintenance Check

Annex 2.1 shows the materials, processes, and sample script for the “Pre-Flight Maintenance Check” skit.

2.2 Flight Dispatch

Annex 2.2 shows the materials, processes, and sample script for the “Flight Dispatch” skit.

2.3 Pre-Flight Checklist

Annex 2.3 shows the materials, processes, and sample script for the “Pre-Flight Checklist” skit.

2.4 Taxi to Runway

Annex 2.4 shows the materials, processes, and sample script for the “Taxi to Runway” skit.

2.5 Take Off

Annex 2.5 shows the materials, processes, and sample script for the “Take Off” skit.

2.6 Air Traffic Control During Pylon Course

Annex 2.6 shows the materials, processes, and sample script for the “Air Traffic Control During Pylon Course” skit.

2.7 Land

Annex 2.7 shows the materials, processes, and sample script for the “Land” skit.

2.8 Taxi back to Gate

Annex 2.8 shows the materials, processes, and sample script for the “Taxi back to Gate” skit.

2.9 Post-Flight Hand Off to Maintenance

Annex 2.9 shows the materials, processes, and sample script for the “Post-Flight Hand Off to Maintenance” skit.

Annex 1.1 – Security Check

Goal:

Ensure prohibited items are not carried on or checked in.

Actors:

| # | Actor | Quantity | Remarks |
|---|-----------------------|----------|-------------------------|
| 1 | Security Officer | 2 | From participating team |
| 2 | Passengers | 10 | Drawn from audience |
| 3 | Passenger Skit Judges | 2 | |

Equipment:

| # | Description | Quantity | Remarks |
|---|--------------------------------|----------|--|
| 1 | Table | 2 | About 1m x 0.6m (3ft x 2ft) for Security Officer to inspect passenger bags |
| 2 | Security Officer "Name" Tag | 2 | Numbered for judges to rate |
| 3 | Passenger "Name" Tag | 10 | Symbolically/numerically indicates Passenger No., gender, age, physical ability, height and size |
| 4 | Passenger Carry On Bag | 10 | Numbered with few interior and exterior pockets |
| 5 | Passenger Checked Bag | 5 | Numbered with few interior and exterior pockets |
| 6 | Allowed Items | 40 | Books, clothing items, toiletries etc. Distribute amongst passenger carry-on bags |
| 7 | Prohibited Items | 10 | <p>IATA prohibited items per http://www.iata.org/whatwedo/cargo/dgr/Documents/DGR-59-EN-2.3a.pdf or http://www.iata.org/whatwedo/ops-infra/baggage/Pages/check-bag.aspx</p> <p>Distribute in the carry-on bags and checked bags of passengers. This will allow the prohibited items discovered during the security check to be put into the checked bags or confiscated.</p> <p>Examples include knives (blunted), nail files, scissors (blunted), lithium-polymer batteries (mock up), and aerosol cans (mock up). Note that some items are prohibited in carry-on bags and others not safe for carriage in any bags.</p> |

| | | | |
|----|-------------------------|----|--|
| 8 | Buckets | 2 | Large enough to accommodate prohibited items |
| 9 | Security Tag | 20 | Labeled with "Security Checked" |
| 10 | Prohibited Items banner | 1 | Graphical representation of prohibited items |

Process:

- a) Set up tables 1 meter apart from each other in the entrance area to the "Passenger Departure" skits area
- b) Prominently display prohibited items banner for passengers to see
- c) Place one bucket each on table
- d) Have passengers form two lines in front of tables
- e) Judges give go ahead for skit to begin
- f) Security officers inspect carry-on bags for prohibited items, ask passengers to place them in their checked bag if they have one, or advise them that it will be confiscated, and places the confiscated item in the bucket
- g) Security officers inspect checked bags for prohibited items and confiscate as needed
- h) Attach "Security Checked" tag on bags inspected and send passengers onto check in area.

Judging Criteria:

- a) Number of items confiscated prohibited items versus secreted in bags
- b) Transfer of carry on prohibited items to checked bags
- c) Placing of security tags on all bags checked

Time Allocated:

1.5 minutes total for 10 passengers. Since there are 2 Security Officers, each one will have to inspect bags in about 15 seconds.

Speed is of the essence, and the judges will note total time taken. In the event of a tie, the teams with the shorter time will be favored.

Annex 1.2 Passenger Check In

Goal:

Ensure passengers are assigned seats appropriately.

Other sections to be defined

Annex 1.3 Departure Lounge

Goal:

Ensure passenger are boarded in proper order.

Other sections to be defined

Annex 1.4 Cabin Seating

Goal:

Ensure passengers are seated as assigned and carry-on luggage is stored properly.

Other sections to be defined

Annex 1.5 Safety Briefing

Goal:

Ensure safety briefing is delivered properly including the usage of emergency equipment such as life jackets (if relevant).

Other sections to be defined

Annex 2.1 Pre-Flight Maintenance Check

Goal:

Ensure maintenance checks the airplane before releasing to operations.

Other sections to be defined

Annex 2.2 Flight Dispatch

Goal:

Ensure dispatcher carries out appropriate checks on airline crew, weather etc. before okaying go ahead to board passengers.

Other sections to be defined

Annex 2.3 Pre-Flight Checklist

Goal:

Ensure cockpit crew runs through pre-flight checklist on airplane.

Other sections to be defined

Annex 2.4 Taxi to Runway

Goal:

Ensure ground control provides met data etc. to cockpit crew and directs taxi to runway for takeoff depending on local wind conditions.

Other sections to be defined

Annex 2.5 Take Off

Goal:

Ensure local control provides takeoff and climb out instructions and hands off to Air Traffic Control (ATC) once in air.

Other sections to be defined

Annex 2.6 Air Traffic Control During Pylon Course

Goal:

Ensure ATC relays proper instructions to cockpit crew for flight around pylon course. The Pilot-In-Command (PIC) will then fly the pylon course per instructions.

Other sections to be defined

Annex 2.7 Land

Goal:

Ensure proper hand off from ATC to local control, and PIC lands airplane per final approach and landing instructions.

Other sections to be defined

Annex 2.8 Taxi back to Gate

Goal:

Ensure proper hand off from local control to ground control and directions as to which gate to taxi back to.

Other sections to be defined

Annex 2.9 Post-Flight Hand Off to Maintenance

Goal:

Ensure PIC hands off airplane to maintenance, and airplane is “safed” per defined procedures.

Other sections to be defined