ICAO RPAS Workshop

Group Activity-Case Study

RPAS Flare Stack/Pipeline surveillance operations

Friday, 13 May 2016

Instructions:

Working group activity

- Participants will be divided into separate groups
- A facilitator will be appointed, who will coordinate the discussions and activities of each group
- Using the templates provided, a summary of discussions will be written on electronic forms for their presentation in the plenary sessions. A member of the group (assisted by other members of the group) will brief on the results

Objective of the exercise

- Conduct an assessment of three pipeline inspection scenarios with SUAS or RPAS and:
  - a) complete an authorization form.
  - b) fill in the Grid for Unmanned Aircraft Operations according to each scenario.
  - c) propose the appropriate limitations for the operation.

Time allocated

- 04:00 hours

Scenario

- o Scenario 1 – Flare Stack Inspection
- o Scenario 2 – VLOS Pipeline Inspection
- o Scenario 3 – BVLOS international pipeline inspection with ATM coordination

Scenario 1 – Flare Stack Inspection

Flare stacks are structures that serve as safety devices in refineries, oil rigs and at other petrochemical facilities. They burn off excess hydrocarbon gases which cannot be recovered or recycled. Excess hydrocarbon gases are burnt in the flare systems as an alternative to releasing gas directly into the atmosphere. Historically, flare stacks have been inspected by cranes, helicopters or sometimes with scaffolding requiring an expensive shut down of the operation and a dangerous environment for the inspector.

Request

A local UAS operator has contacted the State Civil Aviation Authority (CAA) along with a large petroleum company regarding necessary requirements for an authorization to perform flare stack inspections on their privately owned property. The request includes inspection of 10 flare stacks at their refining plant and at remote drilling operation sites. The inspections will be performed by a Walkera Scout X4 UAS in order to perform routine inspection of the flare stack structure, lights, guy wires and flare heads with high definition cameras. The operator is also initiating a trial of continuous structural inspection and monitoring, recording the condition of the structure's welds and bolts, allowing the analysis to performed with greater detail and accuracy by civil engineers at the petrochemical company's laboratory. All inspections will be performed during daylight hours in visual meteorological conditions (VMC) within visual-line-of-sight (VLOS) of the UA pilot.

Operator

The operator is a large civil engineering company who also designs, constructs and inspects oil infrastructure equipment and pipelines. They have just recently expanded in UAS operations to better and more economically serve their customer's needs. The pilots and observers are employees of the operator and have completed the manufacturer's training program.

CAA considerations

Evaluation of UAS operations for flare stack inspections in a remote, low altitude, VMC, VLOS environment. Approval and authorization of UAS flare stack inspections would advance the public interest by significantly reducing the hazards and risks associated with flare stack inspection. Using a small UA would reduce inspection costs for the petrochemical company and would allow for safer and more frequent inspections.

Scenario 2 – VLOS Pipeline Inspection

Oil and gas producers must perform pipeline inspections at regular intervals that are expensive, not 100% reliable and sometimes dangerous when performed using manned aviation assets. UAS technology proposes to revolutionize pipeline inspection methods utilizing high definition and thermal imaging to detect faults, corrosion and other signs of deterioration, while posing almost no risk to humans and without interrupting operations. Results from infrared (IR) sensors and imaging can be interpreted immediately, allowing for the prompt reporting and handling of maintenance and spills in accordance with the operator’s safety management systems. UAS’s can be used to measure and quantify pipeline leaks before they become oil spills. They can also be used as a tool where a spill has already occurred to determine how the oil is moving in water and provide information and imagery to the company’s command center.

Request

A UAS manufacturer has approached a CAA for an authorization to perform pipeline patrols to detect leaks, breaks and provide imagery for maintenance and also to provide imagery of adjacent road infrastructure on an oil company’s private property. The request includes inspection of 200 kilometers for pipeline in remote areas below 120 meters above ground level in VMC VLOS conditions. The inspections will be performed by an AeroVironment Puma equipped with IR, LIDAR and high definition cameras. The operator is also requesting that the VLOS operation consider the use of multiple UA observers (sometimes referred to as extended-visual-line-of-sight (EVLOS). All pilots and observers hold private pilot certificates and current medicals.

CAA considerations

Evaluation of UAS operations for pipeline patrols in a remote, low altitude, VMC, VLOS environment.
The CAA and State legislative bodies have determined that pipeline patrols are in the public interest and are interested in advancing the use of UAS technology as a measure to prevent oil spills and the resulting potential damage to the environment.

Does the CAA’s current UAS approval process provide for use of multiple observers or EVLOS operations?

What mitigations could be added to ensure any risk associated with the operation has been mitigated to an acceptable risk?

Scenario 3 – VLOS Pipeline Inspection

Oil and gas pipelines deliver the earth's natural resources without consideration of flight information regions (FIR) or international boundaries. Many of these pipelines cover thousands of kilometers and multiple States; the use of RPAS for pipeline inspection across international boundaries requires coordination between multiple State authorities.

Request

The RPAS operator proposes a monitoring and inspection program to three adjoining States who share an oil pipeline. The operator proposes to fly operations beyond visual line-of-sight (BVLOS) but within radio line-of-sight (RLOS) in VMC conditions, flying at or below 300 meters AGL utilizing a transponder equipped Insitu ScanEagle that has been issued a type certificate and certificate of airworthiness (CofA) recognized by all three States. The operator will file ICAO flight plans and coordinate with all area control centres and follow ATM protocols. The ScanEagle is registered and bears the appropriate registration marks.
The operator employs only licensed remote pilots and has presented a safety risk assessment to the respective CAAs with a RLOS study, handover protocol and a deconfliction protocol with low level military operations in the area. In addition, all training manuals and operation manuals have been approved by the CAAs.

CAA considerations

How will the CAAs join together to approve this operation?

Do all CAAs use the same authorization form or what differences will be imposed to allow for the crossing of their State boundaries?

Do the adjoining CAAs utilize compatible spectrum bands for civil command and control (C2) links?

Describe your SMS process for "see and avoid".

List all mitigations, conditions and limitations associated with the approval.

Remember

- Once in your group, review the proposed operation, including aircraft specifications, flight operations area, manuals, standard and emergency procedures.
- Begin with the authorization form and fill out the relevant sections.
- Fill in the grid.
- Discuss the CAA's options to approve the operation with the applicable limitations and draft the approval/permit/authorization document.

~End of the Case Study~

Appendix A

REQUEST FOR AUTHORIZATION FORM

Note.— For details on completing this form, and for definitions of acronyms and abbreviations, see section on Information Required for the Assessment of Authorization following this form.

RPAS operator information

1. Name of RPAS operator:
2. State of RPAS operator:
3. Mailing address:

4. Contact numbers:

tel.: fax: cell:

5. Email:

6. State of the RPAS operator, RPAS operator certificate number

(*attach copy of RPAS operator certificate*).

Alternative documents (*attach copy*).

RPAS information

7. State of Registry and aircraft registration (attach copies of certificate of registration and certificate of airwor-

Alternative airworthiness documents (*attach copy*).

8. Aircraft radio station licence number (*attach copy of aircraft radio station licence*):

9. Noise certificate (*attach copy of certificate*).

Remote pilot(s) and RPA observer(s) information

10. Name:	11. Type of licence or certificate and number (*attach copy of licences or certificates*):	12. Experience of remote pilot or RPA observer (*detailed description*):
a)	a)	a)
b)	b)	b)

RPA performance characteristics (including appropriate units of measurement)

(*attach picture or sketch of RPA*)

13. Type of aircraft:	14. Maximum take-off mass:	15. Wake turbulence category:
16. Number and type of engine(s):	17. RPA dimensions (wing span/ rotor diameter):	18. Maximum speed:

19. Minimum speed:

20. Cruising speed:

21. Typical and maximum climb rates:

22. Typical and maximum descent rates:

23. Typical and maximum turn rates:

24. Maximum aircraft endurance:

25. Other relevant performance data or information to declare (maximum operating altitude):

26. CNS capabilities (including alternate means of communication with remote pilot station(s)):

Communications: CPDLC ☐ VHF ☐ UHF ☐ SATCOM ☐ HF ☐ Telephone: landline ☐ mobile phone ☐

Navigation: DME ☐ VOR ☐ GNSS ☐ ADF ☐ ILS ☐ GBAS ☐ RNAV ☐ RNP ☐ RVSM ☐

Surveillance: transponder mode(s): ADS-B ☐ ADS-C ☐ ACAS ☐

Other:

27. Detect and avoid capabilities:

Operations

28. Purpose of operation:

29. Aircraft identification to be used in radiotelephony, if applicable:

30. Date of flight(s):

31. Duration/frequency of flight(s):

32. Flight rules: I ☐ V ☐ Y ☐ Z ☐

33. Type of operation: VLOS ☐ BVLOS ☐

34. Number and location(s) of remote pilot station(s):

35. Handover procedures between remote pilot stations:

36. Point of departure:

37. Point of destination:

39. Route:

40. Cruising level:

41. Payload information/description:

Use of communication capabilities

42. ATS communications:

43. Command and control (C2) link:

44. Communications between remote pilot and RPA observer, if applicable:

45. Payload data link:

Contingency and emergency procedures

46. Loss of C2 link (partial or total):
47. Failure of ATC communications (partial or total):
48. Failure of remote pilot/RPA observer communications:
49. Other emergencies:

Security measures associated with the RPA operation

50. Physical security of remote pilot station(s):
51. Physical security of RPA while on the ground:
52. Security of C2 link:

Liability and insurance

53. Document number of insurance policy (attach copy of liability and insurance document):
54. Attachments:

- [ ] copy of certificate of registration (one for each RPA)
- [ ] copy of certificate of airworthiness (one for each RPA)
- [ ] copy of associated RPAS components certificate(s)
- [ ] copy of RPAS approval
- [ ] copy of RPAS operator certificate
- [ ] copy of aircraft radio station licence(s)
- [ ] copy of licence(s) or certificate(s) of remote pilot(s) and RPA observer(s)
- [ ] copy of all relevant operations specifications
- [ ] rendering or photographic depiction of RPA
- [ ] copy of RPA flight manual emergency procedures
- [ ] copy of liability insurance document(s)
- [ ] copy of RPA noise certificate
- [ ] other attachment(s)

55. Signature of applicant:
56. Date:

PROPOSED LIMITATIONS FOR THE OPERATION
GROUP #

Scenario #

PROPOSED LIMITATIONS FOR THE OPERATION
GROUP #

Scenario #

PROPOSED LIMITATIONS FOR THE OPERATION
GROUP

Scenario #

SEND