

## 2008- System Safety Assessment - Single Engine Airtankers (SEAT)

### SEAT System - SEAT Aircraft

| Sub-System   | Hazards   | Pre-Mitigation |              |         | Mitigation   | Post-mitigation |              |         |
|--------------|---|----------------|--------------|---------|--|-----------------|--------------|---------|
|              |   | Likelihood     | Severity     | Outcome |  | Likelihood      | Severity     | Outcome |
| Capabilities | High Density Altitude effects the aircraft quantity/performance                         | Frequent       | Critical     | High    | Assign appropriate SEAT aircraft for mission and typical DA (Turbine vs. Radial Engine). Conduct pre-project performance planning. Reinforce HHH Training. Acquire incident altitude information when available.   | Remote          | Critical     | Medium  |
|              | Inappropriate Aircraft for Mission  | Occasional     | Critical     | Serious | Ensure SEAT is appropriate for temperatures, altitude terrain and mission. Receive feedback from pilots and Aerial Supervisor.   | Remote          | Critical     | Medium  |
| Maintenance  | Mechanical Failure  | Occasional     | Catastrophic | High    | Pilot & SEMG monitor maintenance schedule. Pilot reviews & understands emergency procedures.   | Remote          | Catastrophic | Serious |
|              | Aircraft Improperly Maintained  | Occasional     | Catastrophic | High    | Follow Contract requirements and Aircraft Maintenance Manual. Aircraft inspectors check that FAA maintenance requirements are met. SEMG ensure pre/post flight inspections completed.  | Remote          | Critical     | Medium  |
| Visibility   | Smoke/Inversion - Inclement Weather conditions between Airbase & Incident               | Frequent       | Catastrophic | High    | Maintain VMC. Practice See & Avoid. Establish Communications. Ensure sound mission planning is performed and weather briefing is received. Know and understand Fire Traffic Area (FTA). Keep windscreen clean. Pilot and ground resources must maintain Situational Awareness. Pilot should exercise go/no-go option.  | Remote          | Critical     | Medium  |
|              | High Visibility aircraft lighting systems   | Occasional     | Critical     | Serious | Aircraft lighting systems need to be utilized and maintained.  | Remote          | Critical     | Medium  |
|              | Congested Airspace, Military Airspace, Uncontrolled Airports, Ramp/Taxi Communications. | Frequent       | Catastrophic | High    | Comply with Interagency Aerial Supervision guide. Ensure effective airspace coordination is conducted between Dispatch & FBOs & Military Units. Understand, review, and discuss the Fire Traffic Area (FTA) in briefings. Review known aerial hazards and acquire complete Dispatch forms prior to dispatching or diverting SEATs. Comply with sterile cockpit procedures & policy . Establish local ramp and taxi protocols in cooperation with local airport operations. | Remote          | Catastrophic | Serious |
| Inspection   | Lack of Standardization   | Occasional     | Marginal     | Medium  | Ensure implementation of standardized SEAT aircraft and pilot inspection process. Train inspectors on new standards.   | Remote          | Marginal     | Medium  |
| Equipment    | Ineffective and out dated equipment   | Occasional     | Critical     | Serious | Equipment required in the contract should be monitored and evaluated. Determine if it is viable to retain as a requirement in the contract. If it does not work - replace it. If it is not needed - remove it from the contract.   | Remote          | Critical     | Medium  |
|              | Inadequate Pre-Flight/Post-Flight Inspections   | Occasional     | Critical     | Serious | Agency and vendor should ensure adequate time for Inspection. Encourage pilot to utilize time to complete Inspections. Document Pre/Post Flight Inspections daily.   | Remote          | Marginal     | Medium  |

| SEAT System - SEAT Aircraft (Cont.) |  |                |              |         |  |                 |          |         |
|-------------------------------------|--|----------------|--------------|---------|--|-----------------|----------|---------|
| Sub-System                          | Hazards  | Pre-Mitigation |              |         | Mitigation   | Post-mitigation |          |         |
|                                     |  | Likelihood     | Severity     | Outcome |  | Likelihood      | Severity | Outcome |
| Communications                      | Changing Technology & Lack of Training   | Probable       | Critical     | High    | Inspection & carding process ensure Contractors (Pilots) are skilled with equipment provided - GPS, VHF & UHF Radios, AFF, etc.  | Remote          | Critical | Medium  |
|                                     | Lack of Radio Equipment Compatibility (Narrow Banding & Frequencies). Future considerations: Digital requirements. | Occasional     | Critical     | Serious | Continue to work with State, City & County Fire Departments to meet future Federal Standards and compatibility issues. Work with national agency/interagency radio program leaders ensure the policies they develop are compatible with aviation requirements.   | Remote          | Critical | Medium  |
|                                     | Inadequate Frequency Management  | Frequent       | Catastrophic | High    | Conduct effective air base in-briefings. Develop specialized training-simulations. Conduct frequent AARs and/or sand table exercises. Perform periodic reviews of frequency lists and avionics equipment operations. Check radio systems following relief pilot duty. Ensure that positive communications are established. | Remote          | Critical | Medium  |
|                                     | Radio Frequency Congestion   | Frequent       | Critical     | High    | Make alternative frequencies readily available. Publish secondary frequencies. Utilize AFF when possible to reduce congestion. Maintain effective working relations with frequency coordinators.   | Remote          | Critical | Medium  |
|                                     | Lack of District flight following frequencies  | Probable       | Critical     | High    | Assign discreet local flight following frequencies whenever possible. Utilize standardized AFF procedures. Utilize National Flight Following if necessary.   | Remote          | Critical | Medium  |

| SEAT System - Maintenance     |  |                |          |         |  |                 |          |         |
|-------------------------------|--|----------------|----------|---------|--|-----------------|----------|---------|
| Sub-System                    | Hazards  | Pre-Mitigation |          |         | Mitigation   | Post-mitigation |          |         |
|                               |  | Likelihood     | Severity | Outcome |  | Likelihood      | Severity | Outcome |
| Documentation                 | Maintenance not tracked well.  | Occasional     | Critical | Serious | Vendor needs to share maintenance information as SEAT moves between assignments. SEMG should be proactive during the pre-use inspection. PI should proactively seek and document maintenance information when the aircraft and pilot reports for assignment. | Remote          | Critical | Medium  |
| Inspection/Evaluation Process | Not Enough Inspectors  | Occasional     | Critical | Serious | Train and utilize more Interagency Inspectors with past SEAT program experience and knowledge.   | Remote          | Critical | Medium  |
|                               | Experience and/or knowledge level of contractor personnel assigned to perform maintenance duties is unknown. | Occasional     | Critical | Serious | Emphasis should be focused on verification of credentials by Government Inspectors. PI should coordinate with COTR.  | Remote          | Critical | Medium  |
|                               | Distractions created by Collateral Duties (A&P/driver/mixer etc).  | Occasional     | Critical | Serious | Avoid overloading support personnel with responsibilities and workload. Utilize additional crew members as necessary.  | Remote          | Marginal | Medium  |

| SEAT System - SEAT Base Facilities (Permanent & Temporary) |  |                |          |         |  |                 |          |         |
|--|--|----------------|----------|---------|--|-----------------|----------|---------|
| Sub-System   | Hazards  | Pre-mitigation |          |         | Mitigation   | Post-mitigation |          |         |
|  |  | Likelihood     | Severity | Outcome |  | Likelihood      | Severity | Outcome |
| Communications   | Lack of Adequate Radio Equipment, Computers & IT Support | Occasional     | Critical | Serious | Continue efforts to upgrade/improve communications and IT equipment, and program support on an annual basis.   | Remote          | Critical | Medium  |
| Security   | Unsecured Air Base Facilities increase risk of sabotage. | Frequent       | Critical | High    | Comply with Contract requirements. Discuss and exercise after-hours options to provide security. Address security concerns during initial briefings. | Remote          | Critical | Medium  |
| SEAT Base Standards  | Inadequate Runway Minimums.                              | Frequent       | Critical | High    | Verify that length, width and surface conditions, congested area and elevation for minimum operational use are adequate. (Make & Model of aircraft). | Remote          | Critical | Medium  |
|  | Inadequate Ramp Space Minimums                           | Frequent       | Critical | High    | Verify that length, width and surface conditions for type and number of equipment and aircraft are adequate.   | Remote          | Critical | Medium  |

| SEAT System - SEAT Contracts |   |                |          |         |   |                 |          |         |
|------------------------------|---|----------------|----------|---------|---|-----------------|----------|---------|
| Sub-System                   | Hazards   | Pre-mitigation |          |         | Mitigation  | Post-mitigation |          |         |
|                              |   | Likelihood     | Severity | Outcome |   | Likelihood      | Severity | Outcome |
| On-Call vs. Variable Term    | Lack of Continuity, Efficiency, Training, Familiarization and CRM with Contractor Personnel and Local Operations. | Frequent       | Critical | High    | Utilizing more Variable Term contracts will increase continuity between contractor and local unit which produces better CRM and reduces exposure/safety issues for managers and ground personnel. | Remote          | Critical | Medium  |

| SEAT System - Personnel (Government) |   |                |          |         |   |                 |          |         |
|--------------------------------------|---|----------------|----------|---------|---|-----------------|----------|---------|
| Sub-System                           | Hazards   | Pre-mitigation |          |         | Mitigation  | Post-mitigation |          |         |
|                                      |   | Likelihood     | Severity | Outcome |   | Likelihood      | Severity | Outcome |
| Utilization                          | Span of Control   | Frequent       | Critical | High    | Ensure that base operations plans address contingency to handle events where span-of-control may be exceeded. Home units need to mitigate this issue by pre-training and recruitment of supplemental personnel.                             | Occasional      | Critical | Serious |
| Management                           | SEAT Managers & ATB Managers are not fully aware of Aircraft Maintenance Issues.  | Frequent       | Marginal | Serious | Agency personnel need to rely upon AMD Technical Service Maintenance Inspectors to determine proper maintenance procedures and authorization to return the aircraft to contract availability.   | Remote          | Marginal | Medium  |
| Training                             | Lack of knowledge and experience in Aviation Contract Administration and Aviation Program Management for SEAT Manager Trainees. | Occasional     | Marginal | Medium  | Recommend SEAT Manager at least attend ACE or equivalent aviation contract administration courses. Add new information in the next rewrite of S-273. Also highly recommend a season of wildland fire line experience.                       | Remote          | Marginal | Medium  |
| Human Factors                        | Fatigue   | Probable       | Critical | High    | Adhere to established work-rest policy/guidelines and promote additional off-time when possible. Request additional staffing and/or detailers during peaks of high fire activity.   | Remote          | Critical | Medium  |
|                                      | Acceptance of Risk as Normal  | Probable       | Critical | High    | Emphasize importance of "situational awareness" as a means to recognizing risk. Consider utilization of the SEAT Coordinator, SEAT Program Manager positions as a method of mitigating risk. Provide Risk Management Training for the SEMG. | Remote          | Critical | Medium  |
|                                      | Changes in standard operating procedures not known  | Probable       | Marginal | Serious | Clarify & Confirm Program changes. Notify appropriate personnel, in a timely manner. Accept questions and seek out responses.   | Remote          | Marginal | Medium  |
| Experience                           | Variable Term vs. On-Call SEAT Manager.   | Frequent       | Marginal | Serious | Provide program oversight (Local, State or Natl., IQCS) to ensure that SEMG meet currency experience requirements and have completed tri-annual refresher as per ISOG   | Remote          | Marginal | Medium  |
|                                      | Aerial Supervision - Lack of SEAT specific knowledge and experience   | Probable       | Critical | High    | Provide thorough pre-mission briefing, conduct post-mission AARs and have an experienced ATGS ride-along if available. Include specific SEAT section for ATGS training.   | Remote          | Critical | Medium  |
| Policy/ Procedure                    | Policy Deviation  | Occasional     | Marginal | Medium  | Re-enforce and emphasize to SEGMS to communicate with SECOs, Contracting Officers, SAMs, etc. when questions and issues arise.  | Remote          | Marginal | Medium  |
|                                      | Multiple Agencies - Differing Standards (State vs Fed)  | Frequent       | Critical | High    | Recommend continued development & implementation of Interagency standardized SEAT program management and policy.  | Occasional      | Critical | Serious |

| SEAT System-Personnel (Contractor) |  |                |          |         |   |                 |          |         |
|------------------------------------|--|----------------|----------|---------|---|-----------------|----------|---------|
| Sub-System                         | Hazards  | Pre-mitigation |          |         | Mitigation  | Post-mitigation |          |         |
|                                    |  | Likelihood     | Severity | Outcome |   | Likelihood      | Severity | Outcome |
| Utilization                        | Drivers not understanding/following DOT Policy/Regulations     | Occasional     | Marginal | Medium  | Stronger emphasis by agency to contractor regarding their responsibility to comply with policies and regulations (rest, driving and duty).  | Remote          | Marginal | Medium  |
| Training - Pilot                   | Potential for Inadequate SEAT Pilot Training                   | Occasional     | Critical | Serious | Continue with further development of contractor SEAT Pilot training program opportunities and/or BLM/FS NAFA & SEAT Pilot Academy.  | Remote          | Critical | Medium  |
| Training - Mixers & Loaders        | Not all Mixers & Loaders are adequately trained and qualified. | Occasional     | Critical | Serious | Ensure that contractors provide adequate training to ground personnel prior to fire assignment. Provide training documentation to agency aviation managers on the mixing and loading of fire chemical retardant products. | Remote          | Critical | Medium  |

| SEAT System-Personnel (Contractor Cont.) |  |                |              |         |  |                 |          |         |
|--|--|----------------|--------------|---------|--|-----------------|----------|---------|
| Sub-System                               | Hazards  | Pre-mitigation |              |         | Mitigation   | Post-mitigation |          |         |
|  |  | Likelihood     | Severity     | Outcome |  | Likelihood      | Severity | Outcome |
| Human Factors                            | Ground support personnel fatigue   | Probable       | Critical     | High    | Ensure contractor compliance with rest and duty limitations for ground support personnel so as not to overextend. (Company and agencies are responsible to monitor closely). Utilize additional crew members as necessary.   | Remote          | Critical | Medium  |
|  | Ground Personnel - poor decision making, multi tasking, mission focus, sense of urgency, peer pressure   | Probable       | Critical     | High    | Ensure that these items are addressed in the contract pre-work meeting and re-enforced in the daily air base briefings, post mission briefings or whenever the need is identified.   | Remote          | Critical | Medium  |
|  | Pilot fatigue  | Probable       | Critical     | High    | Ensure contractor compliance with rest and duty limitations for Pilots so as not to overextend. (Company and agencies responsibility to monitor closely). Allow additional time off if needed or requested. Request relief Pilot if available.   | Remote          | Critical | Medium  |
|  | Pilot - poor decision making: multi tasking, mission focus, sense of urgency, peer pressure  | Frequent       | Critical     | High    | Ensure that these items are addressed in the contract pre-work meeting and re-enforced in the daily air base briefings, post mission briefings or whenever the need is identified.   | Remote          | Critical | Medium  |
|  | Acceptance of Risk as Normal   | Probable       | Catastrophic | High    | Emphasize importance of "situational awareness" as a means to recognizing risk. Consider providing Risk Management Training for the Pilot. Re-address complacency and self discipline in daily air base briefings.   | Occasional      | Critical | Serious |
|  | Poor CRM with crew rotations, crew rotation may affect aircraft/equipment knowledge transfer   | Probable       | Critical     | High    | Make effort to ensure that contractor relief personnel arrive at base prior to relief cycle with sufficient overlap time to receive good in-brief from primary pilot.  | Occasional      | Critical | Serious |
|  | Single Pilot workload may be considered to be excessive based on demands that he/she be able to operate several cockpit equipment items during mission performance (i.e. Multi-Tasking Overload.). | Frequent       | Critical     | High    | Utilize Aerial Supervision if available to reduce cockpit workload. Utilize newer technology such as AFF to minimize radio traffic. Conduct AARs, sand table exercises and on ground CRM Exercises. Incorporate Operations personnel in simulations and exercises.   | Occasional      | Critical | Serious |
|  | Conflicting and/or Difficult Personalities   | Probable       | Critical     | High    | Conduct effective and objective briefings and debriefings. Encourage honest feedback. Maintain positive and professional attitude. Document discussions and briefings.   | Occasional      | Critical | Serious |
| Experience                               | Older and more-experienced pilots are retiring creating an influx of younger, less-experienced pilots.   | Occasional     | Critical     | Serious | Use opportunities for flight proficiency exercises with ground forces in addition to sand table exercises. Agency needs to evaluate current training standards to ensure they meet changing program needs. Maximize opportunities to pair experienced SEAT pilots with less experienced SEAT Pilots on fire missions (pilot mentoring). Maintain and expand opportunities within the industry SEAT Pilot training programs and the BLM SEAT Pilot Academy. | Remote          | Critical | Medium  |
| SEAT System-Technology                   |  |                |              |         |  |                 |          |         |
| Sub-System                               | Hazards  | Pre-mitigation |              |         | Mitigation   | Post-mitigation |          |         |
|  |  | Likelihood     | Severity     | Outcome |  | Likelihood      | Severity | Outcome |
| New Technology                           | Lack of familiarity with technology, inability to utilize and operate equipment.   | Occasional     | Critical     | Serious | Take a stronger approach with all personnel (Pilots, Dispatchers, Managers, etc.) to ensure that they are trained in the function and operation of newer tech-equipment and systems prior to implementation and utilization.   | Remote          | Critical | Medium  |
| Standardization                          | Lack of standardized aircraft, support equipment, and communications equipment.  | Occasional     | Critical     | Serious | Standardize equipment specifications through the procurement process and mandate within the contract solicitation. Work with contractors to emphasize the importance of standardization.   | Remote          | Critical | Medium  |
| Agency Radio System                      | Lack of technical support/inadequate support system.   | Frequent       | Critical     | High    | Agency radio system needs to be replaced, re-designed and upgraded to accommodate current demand and volume of use for current Fire & Aviation programs, as well as those of the future. (Standardize and buy user friendly equipment.) Maintain close working relations with agency radio program leaders to ensure aviation needs are addressed.   | Occasional      | Critical | Serious |

## SEAT System - SEAT Operations

| Sub-System  | Hazards  | Pre-mitigation |              |         | Mitigation  | Post-mitigation |              |         |
|-------------|--|----------------|--------------|---------|---|-----------------|--------------|---------|
|             |  | Likelihood     | Severity     | Outcome |   | Likelihood      | Severity     | Outcome |
| Missions    | Inefficient use of SEATs may result in unnecessary risk exposure to SEAT Pilot and ground personnel. (Risk vs. Reward) | Frequent       | Critical     | High    | SEAT Pilot, Fire Managers, Dispatchers, line personnel, and aerial supervisors need proper education on use of SEATs. Use AAR as mitigation tool to prevent re-occurrence. Conduct pre and post -mission briefings.   | Occasional      | Marginal     | Medium  |
|             | Jurisdiction & Border Issues   | Occasional     | Critical     | Serious | Agency and Contractor should provide training and orientation. Local unit to brief and initiate utilization of the local Airspace Boundary Plan.  | Remote          | Critical     | Medium  |
|             | Defined standard Lead Plane profiles for SEATs   | Probable       | Critical     | High    | Re-enforce local Interagency Lead Plane SOPs for SEAT aircraft tactical operations. Contractors need to also address SEAT/Lead Plane SOPs during annual training.   | Remote          | Critical     | Medium  |
|             | Flying low level at operational weights and airspeeds in areas with hazards.   | Frequent       | Catastrophic | High    | Perform high level reconnaissance prior to descending to work in the low-level environment. Utilize aerial supervision when available. Utilize proper aircraft energy management techniques.  | Remote          | Catastrophic | Serious |
|             | Inexperienced Personnel-Government & Contractors   | Frequent       | Critical     | High    | Agency & Contractors need to evaluate required training to determine if personnel are staying current with program needs.   | Remote          | Critical     | Medium  |
|             | A Sense of urgency may be placed on Contractor personnel at various points in the mission.                             | Occasional     | Critical     | Serious | Address the SAFETY vs. URGENCY issue as a special-emphasis item during in-briefing with contractor and agency employees. Reinforce this throughout the entire operational period.   | Remote          | Critical     | Medium  |
|             | Drop Height Minimums   | Frequent       | Catastrophic | High    | Define 60 ft. obstacle clearance as the minimum decent altitude for all fire operations except during takeoff and landing.  | Remote          | Catastrophic | Serious |
|             | Poor fuel management   | Remote         | Catastrophic | Serious | Monitor fuel quantities. Follow fuel transfer procedures. Pre-flight the aircraft and plan the flight. Know refueling locations. Query other aircraft - fuel status and availability.   | Remote          | Catastrophic | Serious |
|             | Wake Turbulence  | Occasional     | Critical     | Serious | Exercise "CAUTION" when sharing local airspace.   | Remote          | Critical     | Medium  |
| Environment | Conflicting Airspace Environment   | Occasional     | Critical     | Serious | Local agency must provide orientation and "situational awareness" overview to SEAT pilots on Special Use Airspace, MTRs, TFRs etc. Assure that Dispatch and aviation program personnel are trained in Dispatch procedures for SUA. Use aerial supervision when available. | Remote          | Critical     | Medium  |
|             | Hazardous and Extreme Weather Conditions.  | Frequent       | Critical     | High    | Confirm weather information flow is in place. Confirm that red-flag warnings are distributed. Ensure there are continual updates on changing weather conditions shared between pilots, air base managers, dispatchers, etc. Go-No-Go is PIC decision.                     | Remote          | Critical     | Medium  |
|             | Hazards and Extreme Terrain  | Frequent       | Critical     | High    | Get an adequate mission briefing and use performance planning to prevent CFIT events. Perform high level reconnaissance prior to descending to the low level environment. Use Aerial Supervision when available.  | Remote          | Critical     | Medium  |
|             | Congested areas and Urban Interface.   | Frequent       | Critical     | High    | Comply with congested area policies and ensure that aerial supervision is in place or has been requested.   | Remote          | Critical     | Medium  |

|                             |  |            |          |         |  |            |          |         |
|-----------------------------|--|------------|----------|---------|--|------------|----------|---------|
| <b>Communications</b>       | Lack of Available Frequencies  | Frequent   | Critical | High    | Manage available frequencies as best as possible. Request additional frequencies as needed and release frequencies in a timely manner when no longer needed. Train all users in radio discipline.  | Occasional | Critical | Serious |
|                             | Inadequate clarification of Chain of Command-Who is in charge.                         | Occasional | Critical | Serious | Validate tactical (A-G & A-A) contacts identified on the Aircraft Dispatch form. Ensure the pilot has a copy.  | Remote     | Critical | Medium  |
| <b>Performance Planning</b> | Lack of Planning - incorrect calculation of allowable retardant load; weight & balance | Occasional | Critical | Serious | Pilots need to ensure that proper weight and balance and performance planning is completed and shared with base personnel. Utilize appropriate aircraft performance charts for the designated base and area of operations. Base personnel should be aware of trigger points for downloading retardant, water, etc. | Remote     | Critical | Medium  |
|                             | Inadequate runway lengths and/or surface conditions                                    | Occasional | Critical | Serious | Specify length, width and surface conditions, congested areas and elevations for minimum operational use for each make and model of aircraft. This information must be validated by performance planning.  | Remote     | Critical | Medium  |
|                             | Lack of information on incident conditions   | Occasional | Critical | Serious | Utilize A/C dispatch form, obtain as much information as possible from other aerial and ground resources. Obtain information from Pilot after initial load on additional downloads . Use Aerial Supervision when available. PIC has final authority on go/no go.   | Remote     | Critical | Medium  |