

*October 2010*

*Facilitated Learning Analysis*

*Hangar Door Incident*

USDA Forest Service

Rocky Mountain Region



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## *Executive Summary*

In 2005, as the JEFFCO aviation facilities were coming up on lease options, a needs study identified inadequacies for future occupancy. 2007 marked construction of a new facility that, under lease, would meet the aviation group's current and expected needs. Despite the contract specifying hangar door designs that were proven reliable, an amendment was drafted and approved by the vendor and agency that allowed for a unique, single panel door. Immediately after installation, the door became the focus of scrutiny by the aviation staff with a cumulative sense that the door was under-engineered. In 2008, a partial shearing of one of the hydraulic pistons from its mount occurred, but the door lowered and the mechanism was repaired without incident. In 2010, while operating the 75' x 20' door (estimated 10,000 to 15,000 lb) both hydraulic cylinders failed, and the door fell to a closed position.

“It's vital that a team's expectations are continually reviewed to ensure that it understands what it will be receiving.”

A management inquiry followed the event, precipitating a request for a Facilitated Learning Analysis (FLA) that could prompt the staff to look introspectively at themselves and the contracting/leasing process. The goal of this action would be to capitalize on a teachable moment, generating lessons learned and benefiting future coordinated efforts of the USFS.

The FLA Team conducted file reviews, site visits, individual interviews, and facilitated group dialogue sessions. Because the events leading up to the hangar door incident occurred over an extended period of time with numerous parties and undocumented process steps, the Team decided that the “traditional” FLA model needed to be tweaked. Instead of following the FLA's standard question protocols—which are more geared to a specific event and shorter timeline—the Team gleaned organizational and systematic factors which may have contributed to the hangar incident by focusing on three facets: Roles and Responsibilities; Coordination and Communication; and Process.

## ***Background***

The Fire and Aviation Management (FAM) Staff of the USFS, Rocky Mountain Region (R2), utilizes several leased facilities at the Rocky Mountain Regional Airport at Jefferson County Airport (aka JEFFCO Airport) in Broomfield, CO for various aircraft operations. In 2003, the leased T-hangar/operations building and another leased hangar space were determined inadequate for future needs and a larger, consolidated facility was needed prior to the October 2007 expiration of the existing lease. Space needs and other technical building requirements were prepared in 2004 by the FAM staff and submitted to R2 Contracting for procurement of a new leased hangar/operations facility at the same airport. One requirement in these specifications was that the hangar bay be equipped with a motorized, sliding hangar door with a minimum clear opening of 75' wide by 20' high.

In a typical Forest Service leased building project, a joint effort would be pursued between Contracting, Engineering, and the end-user staff (Staff) using the leased facility. Engineering works with the Staff to determine project requirements, detail their square footage needs, and specific building features such as door types, lighting levels, floor finishes, parking capacity, site amenities, etc. Engineering then works with a Leasing Officer from Contracting to translate these project requirements into end-result lease specifications. The final document is reviewed by all parties for completeness and to minimize ambiguities. The Leasing Officer solicits bids from private developers who will provide the requested facility on private land. A small evaluation panel, usually members of Engineering and the Staff, reviews the bid proposals against the lease's special project requirements while the Leasing Officer reviews the financial aspects of proposals. When all parties are in agreement, the lease is signed, and the Lessor (landlord) has construction plans and specifications developed. These documents are reviewed by Engineering and usually by someone from the Staff to verify that what is requested by the lease document is what will get built. Negotiations sometimes occur on what can or can't be provided within the scope of the lease documents. A separate cost rate adjustment may be made if changes are required.

Once all parties are in agreement, the Lessor is allowed to commence construction. From this point on, only the Leasing Officer has the direct authority to officially accept or reject work under the lease requirements, since this will not be a Government-owned facility. Neither Engineering nor Staff personnel may inspect or comment directly to the Lessor's contractor on the quality of the work being performed. If a deficiency or omission is noted it must be brought to the attention of the Leasing Officer. A Contracting Officer's Representative (COR), usually from Engineering, may be designated by the Leasing Officer to monitor the construction of complex structures such as a large office or hangar building. Designating a COR during this phase of the project is recommended but is not a requirement for leases. The COR acts as a liaison to all parties involved to provide technical information related to submittal reviews, help resolve ambiguities, or review and develop cost estimates of changes proposed by either the Lessor or Staff. The COR does not have authority to directly inspect the contractor's work. That duty belongs to the jurisdiction of the government entity that issues the building permit to the Lessor.

In 2005, in the Rocky Mountain Region, it was not a regulated process to designate a team (COTR/COR) to a leasing project.

In the case of the JEFFCO hangar project, a COR was not designated by the Leasing Officer during the construction phase and it appears that Engineering was minimally involved in the project prior to move-in. R2 Contracting issued a Solicitation For Offers (SFO) for the new facility in late 2004. Three separate amendments to the solicitation requirements were also issued

It is not evident who or why additional door types were added to the specifications.

prior to awarding the lease, one of which modified the hangar door specification to allow two additional hangar door styles to be considered as acceptable: a single-panel tip up or a bi-fold tip up style of door. It could not be determined from the documentation or discussions exactly why or who requested these additional door types be added to the specifications.

A single panel door is hinged at the top and uses large hydraulic cylinders mounted on each side of the door for it to raise, lower, and be held in the open position (with constant pressure on the hydraulics). The door panel swings outward and upward from the hangar bay as it is being raised. Sliding doors and bi-fold tip up doors are common while single-panel tip up doors are rarely seen. An information search of a company that provides single panel hangar doors indicates this is a relatively new style of hangar door in the industry.

Crossroads transferred interest in the lease to Flight Services, but Flight Services did not adopt all that was in the building

The lease was awarded to Crossroads Development in July, 2005. Crossroads submitted information in their best and final offer that they would provide a bi-fold tip up hangar door. A few months after being awarded the lease, Crossroads ran into financial difficulties when its bank rescinded their construction loan, mostly due to steeply rising concrete costs after

Hurricane Katrina. Crossroads then transferred interest in the lease to Flight Services with concurrence by the leasing officer.

Flight Services then procured the design and construction of the facility and continues as the Lessor today. From the discussions it appears there was a review of the construction plans by FAM staff prior to construction; there are conflicting perspectives on whether Engineering was involved with reviewing the plans. FAM staff noticed that a single panel hangar door was shown on the plans and questioned the leasing officer why that style door was going to be built instead of the sliding door requested in their original special requirements document. The leasing officer determined that a single panel door was allowed per one of the previously issued SFO amendments and therefore met the SFO requirements. FAM staff expressed concerns over this style of door during this review though the exact nature of their concern (safety, functionality, familiarity, etc) was not documented and did not come out in the discussions.

There were considerable delays during Flight Services' efforts to obtain a lease for the site from the airport authority and a building permit from Jefferson County. The approximate date of ground breaking could not be determined.

During the construction phase, the leasing officer did periodic monitoring of the construction and relied on the Jefferson County building inspection department as the only onsite construction inspection. FAM staff members, who had no designated authority with monitoring compliance of the lease requirements, periodically visited the site during construction and noticed the single panel hangar door being constructed. Some unflattering comments as to why this type of door was being built and other perceived or actual building deficiencies were directed to contractor and to the leasing officer. While significant differences of opinion regarding the type of door to be allowed, there appears to have been no documented communication between FAM, Engineering, and the Leasing Officer about facility changes (including the hangar door) emerging in construction.

The construction proceeded and substantial completion and occupancy of the building occurred in October, 2007. Just prior to move in, a list of deficiencies (typically called a “punch list”) was developed jointly by the leasing officer and the regional engineers. Shortly after move-in, FAM staff also inspected the building and submitted their punch list to the leasing officer. At the leasing officer’s request, R2 Engineering was asked in early December, 2007 to inspect the facility and develop another punch list. Some of the items documented in this punch list appear to be building code deficiencies that should have been noted by the county building inspector prior to issuing an occupancy permit (inadequately built fire walls, missing ceiling insulation, etc). R2 Engineering re-inspected the building in March, 2008 to document the building owners progress (or lack thereof) in correcting their December, 2007 punch list. Another punch list inspection was done by R2 Engineering in June, 2008. A September 24, 2008 letter from the Leasing Officer to the Lessor states that almost all punch list items had been remedied.

A major problem with the hangar door first occurred in November, 2008 when the mounting pin broke at the top of one of the hydraulic cylinders and the mounting pin bracket on the door frame was damaged. There are also accounts of ongoing problems with the hangar door since move-in, related to opening the door when the wind is blowing, which caused minor damage or misalignment of the door panel or its mechanisms. These problems were reported to the property manager who was reported to have repeatedly said something like “why do you keep opening the door when the wind is blowing?” There was concern by FAM staff about the integrity and safety of the door in a strong wind when the door is in the open position and with not being able to fully

close the door. The door would sometimes not fully close, gaps were noticed at the door bottom, and debris would blow inside the hangar. The hangar door was retrofitted with metal rods that could be lowered into holes in the concrete floor when the door was fully closed to keep the door from moving during high winds. At times the door was out of alignment and the metal rods could not be lined up with the holes. The landlord's repair to that problem was to enlarge the holes.

On August 12, 2010 a failure of the hangar door operator system occurred as the door was being opened. Below is the critical narrative of the event taken from the SAFECOM report:

*On 8/12 after receiving a call from my passengers that we would not be departing KBJC until the next day, I decided to put aircraft NXXXXX back in the hangar. I had pulled it out of the hangar about an hour earlier in anticipation of my passengers arriving. As I was raising the door, with about 2 inches to go before the door was high enough for the airplane to get under it, the end of the southern hydraulic cylinder connected to the hangar {not the end attached to the door} broke off from the frame it was welded to. I immediately stopped actuating the door, however, that end of the door began to fall back to the ground, as it fell it placed a large amount of torque on the remaining cylinder and it broke off as well, causing the entire door to fall uncontrolled, and slam back into the closed position. It should be noted that the location of the operating controls of the door, places the operator directly underneath of the northern cylinder, and had the hydraulic lines attached to the cylinder and secured to the hangar wall not held, and the cylinder had broken free, it would have hit me in the head. I moved as quickly as I could, but it all happened so fast, I don't think I would have been able to get out of the way in time. It should also be noted that we are extremely lucky that it broke while no airplanes were being towed in or out of the hangar, or someone was walking under it to go out to the ramp. Had that door fallen while an airplane was underneath of it, it most likely would have destroyed the airplane, or hurt the person towing it, or worse. I immediately called the regional AMI and informed him of what happened, and I left all controls in the position they were in when the incident occurred. Although the previous actuation of the door {when I pulled the airplane out of the hangar} gave no indication of pending failure, in my opinion that hangar door is way too heavy for the type of actuating cylinders it has. It needs to be a Bi-fold door and made of lighter material. The span is too long for a single swing door.*

## *Sequence of Events*

The following events leading up to the hangar door incident were identified as potential key junctures in which decisions were made that potentially enabled the incident. These events were identified from the leasing files and are not a comprehensive representation of the timeline or of events contributing to unintended event.

<b>DATE</b>	<b>EVENT</b>
5/25/04	Request for Contract Action (facility technical requirements included hangar door specifications, i.e. “motorized sliding door is required”.) submitted to Leasing Group by Fire Aviation Office.
12/27/04-01/12/05	Solicitation for Offers issued; included specifications as outlined in the request for contract action by FAO.
May 2005	Three amendments issued to solicitation; several changes to solicitation including one that modified hangar door option, allowing single panel, bi-fold, tip-up, or motorized sliding; Occupancy date modified to provide for occupancy on 02/4/06.
06/22/05	Clarification letter outlining successful bidder’s (Crossroads Development) final terms and conditions was issued by CO. Relevant terms included bi-fold tip-up hangar door with specification as provided by successful bidder.
06/30/05	CO letter issued to FAO requesting approval to award to Crossroad Development outlining several key terms regarding for award granted for leasing action (SFO amendments/specifications for door not included).
	Prior to award, successful bidder transferred interest to Flight Services.
07/01/05	Lease issued to Flight Services: contract outlined terms and conditions, including hangar door bi-fold tip-up design. Aforementioned amendments (#1-3) also included as part of lease contract (allowing three different door designs).
Unknown	Single panel door is installed; no documentation provided of daily logs or notification of Forest Service.
09/01/07	Original planned occupancy of new hangar.
10/01/07	Forest Service acceptance and occupancy of hangar; final punch list to be issued in separate correspondence.
10/31/07	Expiration of old hangar lease
12/01/07	Draft Forest Service (Engineering) Inspection List
03/31/08	Final Forest Service (Engineering) Inspection List
09/24/08	Physical inspection conducted on Sept. 24, 2008 certifying that June punch list Inspection list had been completed
11/04/08	Email from Forest Service to owner’s representative regarding hangar door problems.
08/12/10	Hangar door failure and uncontrolled closure

## ***Conditions***

Based on its file review and interviews, the FLA Team identified three major work environment areas requiring analysis: (1) roles and responsibilities, (2) coordination and communication, and (3) process. It is within these three areas that individuals and staffs had the opportunity to make decisions that would ultimately lead to the unintended event. The outline below was crafted to guide the Team's inquiry, the facilitated dialogue, and resulting recommendations.

### **Roles and Responsibilities**

*Were roles and responsibilities clear to all parties during:*

- selection of door type?
- contract amendments affecting potential door type?
- construction monitoring?

### **Coordination and Communication**

*Was there sufficient communication and coordination between all parties when:*

- initial facility requirements were provided?
- major specification modifications were issued prior to award?
- construction began and door was installed?

### **Process**

*What lessons did you learn that could improve the process for the Region?*

*What should be communicated for overall organizational learning?*

## *Lessons Learned from FLA Participants*

The following lessons learned/recommendations come directly from participants in the facilitated dialogue or other exchange of information with the FLA Team. They are valuable for process documentation as well as consideration by the FLA Team for its own recommendations but should not be construed as formal recommendations to leadership.

- Don't accept a product (i.e. the hangar) until quality is assured.
- Design details need to be submitted up front for the organization's review.
- Open forums and processes are needed to ensure better quality.
- Employees need to feel empowered to "see something and say something."
- Employees need to avoid assumptions and communicate facts throughout a process.
- Training of employees to better understand leasing processes and how to contribute to that process is imperative.
- Workloads need to be balanced and responsibilities confirmed.
- Formal and regular inspections would ensure quality of a product.
- Delays and a sense of urgency can lead to liberal acceptance.
- It's vital that a team's expectations are continually reviewed to ensure that it understands what it will be receiving.
- Narrower technical standards need to be provided early in the process so expectations of the end user can be better assured.
- A technical evaluation panel might be valuable to ensure that the facility needs are met.
- The Agency should never have moved in with life/safety code issues remaining.
- The facility needs to be designed more thoroughly before advertising.
- The leasing process needs to provide more detailed design requirements from the end user
- Even if an employee is not directly involved in contract administration, he/she needs to have an avenue to speak up if something doesn't look right.
- Assumptions (about the leasing process) have prevented us from communicating effectively.
- The Agency should do internal inspection of leasing project instead of relying on county/owner.

- Develop standard design specifications for facility lease construction projects.
- Prior to any lease construction projects, develop a team composed of leasing officer, COR, COTR, engineers, project inspector and plan timelines and meeting dates for the course of the project.
- Create future facility leases that allow the Government to terminate the lease at the convenience of the government. Currently lease locks us in for 10 years.
- Require biannual facility inspections with the contractor AND an agency structural engineer. If these inspections had occurred, it's possible some of the serious facility/structure issues we are addressing today could have been resolved much earlier before they became life threatening.
- Require prework meetings that include all individuals involved in/with the lease.

## *Lessons Learned from the FLA Team*

### ROLES & RESPONSIBILITIES

- Transitions in staff and workload seemingly contributed to a lack of officially identifying a project team, including COTR and fire/engineering participation. (A COR was not designated until after construction was complete.)
- Leasing Officer assumed responsibility for design and construction decisions and oversight, and review and approval of technical amendments, including door modifications.
- Formal pre-work and periodic meetings did not occur, preventing the delineation of roles, responsibilities, and expectations.

### COORDINATION & COMMUNICATION

- There was an early perception by FAM and Engineering that a different door would be installed than the contract eventually allowed.
  - Leasing did not appear to communicate with FAM about the contract amendments allowing different door types.
  - FAM's emerging dissatisfaction about the single panel door was verbalized but no documentation regarding this input was provided to the leasing officer.
- There appears to have been an ongoing lack of communication and coordination between Leasing, Engineering, and FAM when major technical specification modifications were issued prior to award and appropriate oversight during construction phase.
- Employees were not empowered or the process did not allow for employees outside of the leasing authority to express concern about the project's development, regardless of cost or process implications.
- Conversations and file notes revealed potential interpersonal and poor working relationships at many levels that would likely contribute to a non-communicative work environment.

Lack of official documentation—project delegation letters, construction schedules, monitoring logs, etc.—contributed to inadequate sharing of information and the team’s inability to discuss changing expectations.

## PROCESS

- The Contract was awarded with ambiguous specifications for the hangar door style.
- A construction schedule was not present in the file.
- Lessor apparently did not submit a construction schedule per the lease contract.
- There appears to have been a continuous lack of clear and concise documentation regarding hangar door design requirements and contract amendments.
- There was no FAM approval of solicitation amendments regarding the hangar door.
- There is extensive documentation about punch lists and inspections; however, inquiry into hangar door type and capacity does not surface until after occupancy.
- Due to inconsistent contractual documentation, there was an inability to hold lessor to FAM’s expected door design.
- Forest Service did not exercise right to review and approve schedules and progress reports.
- There was no peer review of documentation throughout the process.
- Process checks were not in place to prevent contract ambiguity of allowable door styles or correct contractor’s un-communicated door change.
- There was an apparent lack of periodic inspections by Agency representative during progress of work.

### ***Recommendations by FLA Team***

This unintended outcome potentially resulted from an environment in which poor team dynamics and communication collided with a series of unanticipated events. As the events leading up to the incident spanned many years, involved numerous participants, and went through a myriad of process steps, the recommendations for avoiding this outcome in the future are similarly broad. It should not be assumed that the following recommendations, whole or in part, would have in themselves prevented the hangar door incident. However, their presence in this scenario may have provided the needed intervention to remind individuals of their responsibilities, authorities, and communication needs.

- The FLA Team recommends that a documented project initiation —delineating the roles, responsibilities, and authorities of each program area and individuals involved—could aid in communication across program areas, especially during times of transition and/or heavy workloads. The letter would also outline the general process to be followed including timelines and communication junctures, and leadership’s expectations of internal communication.
- The FLA Team recommends that, in fulfilling expectations of a project letter, formal meetings between program areas be institutionalized at pertinent process points (e.g. contract drafting, pre-work meetings, construction schedules, inspections, etc.) to ensure that all participants are sharing (not assuming) information and expectations and providing peer review. In short, a complex process such as this cannot rely on informal and undocumented communications.
- The FLA Team recommends that the Leasing Officer begins to meet with the Contracting Officer’s Representative (COR), Contracting Officer’s Technical Representative (COTR), and Project Inspectors as early in the contracting or leasing process as possible to establish that roles and responsibilities are clearly defined and a process for reporting contractual discrepancies is understood.

Regarding the FLA process itself, the Team recommends building regional knowledge and capacity of FLA management to ensure that local expertise is readily available to coach or participate in future teams.

## *FLA Team Participants*

Garth Smelser	FLA Team Lead	Deputy Forest Supervisor, Lincoln NF
Shannon Clark	FLA Engineering SME	Facilities Engineer, Coconino NF
Wendy Castineira	FLA Leasing SME	Leasing Officer, Region 6
Ted Moore	FLA Team Coach	Retired Regional Fire Safety and Training Branch Chief, Region 2

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