

**NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, DC 20594**

SUMMARY OF INTERVIEWS

-- CEN19FA238 --

The interviews conducted on July 29, 2019 were completed at an US Aviation Group (USAG) facility in Denton, Texas. Present for the interviews included NTSB, FAA, Lycoming, and Piper. Mr. David Cruz (USAG Flight Ops) was present for all interviews. Mr. David Anderson (USAG Maintenance) was present for Mr. Ramirez. The interviews conducted on August 1, 2019 were completed at the locations noted, and only the NTSB and FAA were present.

**Nicholas Ramirez
Flight Instructor (April 2018)
Hired at US Aviation January 7, 2019
CFI, CFII, MEL, MEI, COM MEL**

Interviewed July 29, 2019

Mr. Ramirez was practicing maneuvers with a student on July 24, 2019 from 1800 to 2100. They departed on the training flight with 93 gallons of fuel on-board. They had flown to GLE and were conducting short field landings. The landings were full stop landings with a taxi back to the runway for departure. They would use both engines for short field landings and the student had “firm breaking” after touchdown. They had been flying for about 2 hours when the left engine quit on touchdown. Within about 2 to 3 seconds after touchdown, the left engine “sputtered and died.” They taxied off the runway and he discussed the options with his student. They attempted to restart the engine using the engine “hot start” checklist. Mr. Ramirez recalled the checklist was: throttle to idle, propellers full forward, mixture rich, alt air off and cowl flaps open. The engine re-started on the 4th attempt. They completed a normal engine run-up, departed GLE, and flew back to DTO. Once at DTO, the Mr. Ramirez submitted a squawk by emailing dispatch with the details of the engine failure.

Mr. Ramirez explained the mixture was at full rich for the entire flight prior to the engine quitting. He did not see any fluctuation in the fuel gauge, there were no abnormalities in any of the gauges.

Mr. Ramirez stated he made the decision to fly back to DTO on his own. He had not experienced any problems with the engine prior to it quitting on landing at GLE, the engine had been performing well with no problems in flight. There were no further issues with the airplane on the return flight to DTO, the left engine maintained power all the way to the ramp area. They had practiced a full engine shutdown on the right engine during the flight and it had restarted normally. Mr. Ramirez did not fly in N456AG again before the accident.

Mr. Ramirez explained the squawk process for reporting the engine failure. After landing at DTO, he parked the airplane on the ramp and sent an email to dispatch as he walked into the terminal. Dispatch would then copy and paste his email into the squawk log. Mr. Ramirez placed a red tag on the keys to the airplane, indicating it was grounded, and placed the keys in the “key box.” In his report to dispatch, he advised not to fly the airplane.

Mr. Ramirez advised he had heard, on a flight prior to his, another instructor reported one of the engines on N456AG had quit during taxi for departure. During this event, the other instructor returned and call maintenance to triage problem. Mr. Ramirez was not sure of the specifics on which engine or what was done to fix the issue.

Mr. Ramirez was asked to explain the sump procedures during pre-flight. He explained he sumped both engine prior to every flight. He sumped from each wing and the engine cowling. He would use a fuel tester, filling it with the samples taken between both wings. If there was water in the sample, he would call maintenance. Otherwise, he would pour the sample back into the wing through the filter.

Mr. Ramirez was asked to explain how he conducted simulated engine out training. He stated the simulation the instructors at USAG use is zero thrust, with 11 inches of manifold pressure and 2,000 RPM. The instructors do not feather the propeller of the engine out.

Mr. Ramirez had only flown N456AG one other time prior. He typically flew the PA-34 airplanes, but different tail numbers. He explained that USAG had 11 PA-34 airplanes at their base at DTO, and 5 more at their base in Dennison, Texas (GYI).

Richard David Anderson
Director of Maintenance (July 2019)
Hired at US Aviation March 2019
Received A&P in 2008

Interviewed July 29, 2019

Mr. Anderson explained that he had his A&P certificate, though most of his career had been in management.

Mr. Anderson stated the engines on N456AG were new, they had only been installed on the airplane for a couple weeks. The engine replacement included new parts for everything “firewall forward.”

He reported the triage system was initiated to handle minor maintenance items that did not require a squawk or removing the airplane from service. The work was completed on the flight line under a mechanic’s A&P license. All triage events were supposed to be logged in the “Triage Log” that outlined the corrective maintenance completed to address the issue. The work was also supposed to be recorded in the airplane maintenance logbooks, like all other maintenance completed on an airplane.

John Tano
Mechanic/Night Shift Supervisor for USAG
Interviewed July 29, 2019

Mr. Tano stated he worked on N456AG on July 25th to address the squawk by Mr. Ramirez. There were 22 hours total time on the engine at the time of the squawk. The squawk noted “engine died on landing.” Mr. Tano taxied the airplane to the run-up area and ran to bring the engines to operating temperature. It ran for about 15-20 minutes. He increased the engines to full power, “jerking” the engines up and down with the throttle. The engines did not “sputter or stutter.” Mr. Tano checked the magneto drops; they were normal. There were no fluctuations of fuel, fuel pressure or oil pressure. The engine idled between 700-800 RPMs. He completed a lean-idle mixture and recalled the left engine was between 50-60 rise. He completed some more “power jumps” to get the engine to stall, but the engines performed “admirably” each time. He taxied the airplane back to the hangar with the mixture “a little leaner” but the engines did not quit. At the hangar, he opened the engine cowlings to look inside. He explained that “fresh engines” sometimes have rags, birds, etc. in the engine, he was looking for anything similar. There was nothing abnormal in appearance, and the Chief Inspector agreed. The airplane was returned for service after he could not duplicate the engine failure.

It was squawked again by a pilot. His shift was over and was headed home; he asked his crew of mechanics to troubleshoot the problem. He was later informed the idle was raised to address the problem. Mr. Tano explained his manager, Mr. Shane Alley, advised his crew to raise the idle. Mr. Alley had a conversation with Mr. Tano about the first squawk for the engine failure and his manager told him to raise the engine power [idle]. Mr. Tano was not aware of any additional testing that was completed after idle was raised.

Michael Wilkinson
Mechanic for USAG
Interviewed July 29, 2019

Mr. Wilkinson stated he last worked on N456AG the morning of July 28th. He completed his work on the airplane about 1000. He installed a hydraulic power pack for the landing gear and adjusted the idle 1/8th of a turn. After completing these maintenance items, he taxied the airplane out to run it up. It ran for about 15 minutes. He reported the engine idle was 750 RPM, there was a magneto drop between 50-75 on both engines, and there were no fluctuations on the gauges. He stated he did not run the engine at full power, he ran it about 1800 RPMs.

Mr. Wilkinson explained he was told to step up the idle 1/8th turn by Mr. John Schaffer, he did not make the decision to do so on his own. It was part of the same work order from the July 25th work order. Mr. Schaffer completed the initial work to order the pump for the power pack and Mr. Wilkinson completed the work. The hydraulic power pack was installed on July 27th and the idle adjustment was made the morning of July 28th.

The inspection for the PA-34 airplanes was 100-hour annuals, 50-hour oil changes, and compliance with the landing gear Airworthiness Directive.

Nicholas Romagosa

Former Flight Instructor at USAG (Resigned from USAG on July 26, 2019)

Interviewed on August 1, 2019

Mr. Romagosa explained he had left the flight instructor position at USAG the Friday before the accident. He was part of the training system at Envoy and had accumulated the required hours to move forward in his ATP training.

Mr. Romagosa flew multiple different PA-34s while instructing at USAG. Many of the flight instructors had concerns with the maintenance practices of these airplanes at USAG. The instructors brought it up in a safety meeting that maintenance was a recurring issue and they felt it was a safety concern. Maintenance was also involved in these meetings and said they would look into the concerns. Mr. Romagosa gave examples of responses instructors would receive when reporting an issue to maintenance. When instructors reported an engine cut during run-ups, they were told it was because the students were pulling back on the throttle too far. When instructors reported a fuel gauge problem, maintenance told the pilot the fuel gauges only need to be accurate when they are at zero. There were instances of seatbelts installed backwards. N277AM, another PA-34, was squawked numerous times for an oil leak. Maintenance reported they addressed the leak(s) but the airplane continued to leak. After repeated squawks, maintenance drilled holes in the cowlings to drain the leaky oil and the flight instructor would add oil before flights. While Mr. Romagosa was on a training flight in N1972B, they experienced an engine shutdown in the run-up area. He called maintenance from the run-up area for triage but maintenance told him to bring the airplane back to the ramp. He taxied back to the ramp and put the airplane into maintenance. There was a dual propeller strike on N456AG during a go around that was never reported to the FAA. The propeller strike was the reason it received new engines.

Mr. Romagosa explained there was a group text message between the PA-34 instructors to discuss maintenance issues or other happenings that everyone needed to know.

He said the triage system for maintenance was used to determine if there was an “easy fix” to the problem. If the fix was not easy, the instructors would create a squawk report to send to dispatch.

Mr. Romagosa felt that maintenance was “just trying to keep their head above water.” He believed maintenance wanted to keep the airplanes flying, so proper testing and resolution of problems did not occur. Instructors felt pressure to fly “minimum airworthy” airplanes because of the lack of airplanes to fly. Mr. Romagosa felt there was some animosity between maintenance personnel and the flight instructors, mainly because the airplanes were in “crappy condition” and problems that were squawked were not being fixed.

Mr. Romagosa stated it was the Commercial Leader’s task to counsel student pilots and work with those having trouble. The review board was in place [to address underperforming students]. The review board consisted of the flight instructor, the private/instrument/commercial manager and the student. Typically, the first meeting of the review board would identify deficiencies. There was no disciplinary action. A second review board meeting would determine if the same deficiencies exist or there are new deficiencies. The second review board was more strict, students were given a warning of termination and had to fly with the lead flight instructor. This

was to put a more experienced pilot with the deficient student. If a third review board was needed, that constituted termination. Each review board was documented, and the Chief Flight Instructor received the review board reports. Every review board had a different process dependent on which flight certificate the student was working on.

Mr. Romagosa believed there was a different standard of performance for the Asian nationals versus that of an American student. There was a “just get him back to China mentality.” USAG is “adamant” that the Asian nationals must meet the training course outline (TCO) on time. If a student was not meeting the TCO times, the instructor would talk to their manager. Whatever time and experience the student had, is what they had before being pushed to next step.

The accident student pilot was not proficient in English, when Mr. Romagosa flew with him there was an English barrier. He stated many students are not as proficient as they should be but the English barrier just gets looked past. It is a point of frustration for flight instructors when trying to teach and they are unable to communicate. Mr. Romagosa stated he had to “slap hands off the controls” to have a student understand the command of “my controls.” The poor ESL has been part of the review board discussions in the past. Instructors were told to “just push the students through.” Mr. Romagosa believed the pace of the curriculum should be good, but the student’s English is so bad it hinders the instructor’s ability to teach. An example was engine out drills, he explained multiple Asian national students would “pull back the throttle and the mixture” for simulation instead of only throttle.

He stated there was a “battle” between USAG and the Asian airlines. He was not sure whether USAG kept the money received for training or must refund the airline if a student were terminated from training. The Airlines continually give the students “one more chance.” The “lines are blurred” between following the FAA standards for training versus keeping the airplanes happy.

The business at USAG was 90% Asian nationals and 10% domestic students. They were trying to grow their domestic business.

Mr. Romagosa also explained there was a shortage of check-airmen at USAG. At any given time, there were about 130 students on check and sometimes they would wait 1-2 months before they were given a check-ride.

He stated Mr. Tyson Walker does not have a good relationship with the flight instructors. Mr. Walker advised the instructors that if they felt they were not flying enough they should go get a second job. Mr. Romagosa believed Mr. Walker was more interested in the political side of the business.

Ms. Catie Fillios, who left USAG to work in the Envoy program, was the accident pilot’s first/previous main instructor. Mr. Romagosa stated he knew Ms. Fillios had texted the accident instructor when she took over training the accident pilot, asking the accident instructor to “take good care of him [accident student].” Mr. Romagosa interpreted that as “get him [accident student] through the program.”

Mr. Romagosa stated the accident instructor had a broken left arm and she had just been cleared by the doctor to fly again. Other than the day before he accident, he stated she had not flown for about a month prior.

When asked why Mr. Romagosa stayed at USAG as an instructor pilot, he said the “instructor pilots stay at USAG because of the connection with Envoy, the American Airlines feeder program.”

David Cruz, Chief Pilot
Tyson Walker, Vice President of Flight Operations
Interviewed on August 1, 2019 at USAG

Mr. Cruz stated the accident instructor was chosen to fly with the accident student because she was available to work. Initially, management had a different instructor in mind to fly with the accident student, but that instructor was on vacation. The accident instructor was briefed by the multi-engine Group Manager on which areas were deficient and needed re-training. She was asked to fly with the student to assist in correcting his deficiencies. Mr. Cruz explained she was not one of their lead pilots, but he had just finished her single-engine proficiency check to be a company check airman and he was getting ready to start her multi-engine proficiency check next.

Mr. Cruz and Mr. Walker were asked to discuss the failure rate for the Asian nationals in their program. Mr. Cruz stated the airlines had rules in place, if a student failed more than 3 stage checks, the airline would consider termination. However, the airlines were “not always consistent in application of this rule.” The airlines would make the decision to terminate training, not USAG. The exception was if the student broke the law or a rule of the student’s contract, then USAG would notify the airline of unsafe behavior and recommend termination. The airline made the final determination. There was some pressure on USAG to keep the students in the program. The expectation from the airlines was if they sent a student over for training, he/she would come back with all ratings completed. He estimated there was approximately 11%-12% failure rate over the 12-13 years the training program had been in place. There were between 15-25 Asian nationals in each class, and a new class came in every 4-6 weeks. In a one-year period, there were about 200 students in various steps of training. The training program length is 12-14 months.

The review board was in place to document a student’s deficiencies. For example, a student must have completed his solo flight within 30 hours of training, but the average is 19 hours. If the student was not picking up the necessary skills to solo, a review board was formed and USAG might advise the student to reconsider flight training. The review board also considered other factors that could impact training progress, such as the student’s attitude. The typical outcome of a review board was either more training or terminations. USAG could keep going back with as many review boards as needed until the airlines terminated the training or USAG refused to continue training. Refusal of training was very rare. All review board reports were sent to the sponsor airline. He explained the accident student had one review board, in relation to two failed stage checks. After the second multi-engine stage check failure, USAG went to airline to request 5 hours of additional training for the accident student.

It was explained that if a student fails a stage check with a USAG check pilot, the student would return to their primary instructor for additional hours of training. If the student continued to display deficiencies and was required to fly with the lead instructor, there would be a verbal handoff of instructors and the student would be informed of their deficiency. The lead instructors brief the Group Leaders of the flights once they had been completed, there was no formal documentation process.

When asked about the discrepancy in student training records having negative comments recorded by the flight instructor but the lesson marked as “pass,” it was stated that a pass/fail was dependent on what the lesson standards were and was determined by the instructor. If a student’s flight was not satisfactory for the objectives of the lesson, it was marked in the records as “not satisfactory.” If the student met the objectives of the lesson but the student still struggled in other areas, the lesson is a “pass,” but the instructor might include the area(s) the student struggled with in the notes. The Group Leader was responsible to monitor the pass/satisfactory completion of a lesson, versus the comments from the flight instructor on areas of poor performance. If a student failed a single lesson more than two times, a meeting with management and the pilot was conducted to discuss a way to master lesson tasks.

The syllabus for the Asian nationals training course outlines (TCOs) gave the students more flight hours to pass the course. China required USAG to have a total of 250 hours of flight training to complete training, the syllabus was created to accommodate those hours. The training was a fixed price contract and was driven by the need for money to keep a student flying. Students were employees of the airlines that sponsored their training. They must meet the TCO, if the TCO was not met the student was “not fitting the mold” the outline requires and might not meet the airlines standards.

The pressure came from the airlines’ refusal to accept USAGs recommendation for terminations. The airlines would often attempt to blame the flight instructors for poor student performance. If a student was terminated, there was little repercussion for USAG. USAG received full pay of the contract if they maintained an 80% or better student training completion rate. For the student, the repercussion was more significant, “they signed a 99-year contract to the company for employment. The students were under a lot of pressure.”

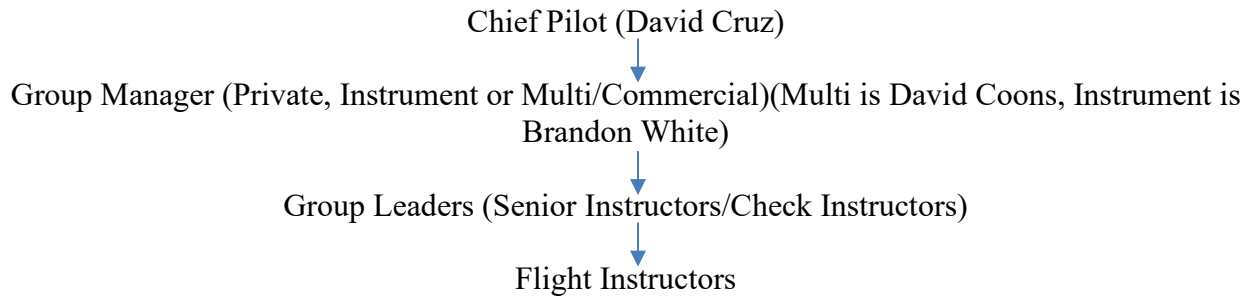
When students first arrived, their English was “rough.” There were Chinese speakers on staff at USAG to help translate.

Mr. Walker stated that instructor pilots were put in “dangerous situations all the time.” They typically put more experienced pilots with the students needing additional instruction to meet the standards. The biggest problems they saw was “good aeronautical decision-making and a difficult shift in culture for a pilot to take command.” The students often deferred authority and did not want to make any decisions.

The hierarchy of the flight instructor was explained as follows:

VP of Flight Operations (Tyson Walker)





The 6-week break in the student pilot's training was due to an error on USAG's part. The Group Manager was on vacation and the request for additional funds from the review board was delayed while he was on vacation.

Matthew Scott Harreld

USAG Flight Instructor

Interviewed July 30, 2019 via telephone and August 1, 2019 in person

Mr. Harreld stated he started working at USAG in April 2018 as a flight instructor and had been a check airman for USAG since February 2019.

Telephone Interview:

Mr. Harreld explained he was the first one to experience trouble with the engines on N456AG. The right engine had a "power failure" during taxi about 1600 on July 24th. Everything appeared normal during preflight. However, when the engine was pulled to idle power, and he rested his hand on the throttle levers, the engine would die. He waited for "a second," restarted, and ran the engines at 1,000 RPM. When he brought the power back to idle, the right engine died again. He called for triage, taxied N456AG to the east ramp via taxiway J, and shut down the engines. When maintenance arrived, Mr. Harreld replicated the problem for the mechanic by starting the engine and pulling the throttle to idle to cause the engine to quit. The mechanic (Mr. Matt Steinbridge) did "something with the idle; he rotated something on the inboard side of the right engine to adjust idle to 700 RPM." There was no more time for the instructional flight, so he taxied back to the ramp and parked the airplane.

Mr. Harreld said the triage system was used when there was a mechanical issue that was minor, maintenance would look to see if it could be corrected right away. There was not formal training on use of the triage system, i.e., what problem(s) fit into a triage event or what did not. Mr. Harreld stated he knew it was not for any major maintenance issues. If the mechanic was unable to fix the problem with triage, the airplane was "red tagged and squawked." The flight instructors had access to the squawk system but could only see if the squawk was "issued, verified, or fixed." The flight instructors could not see what was completed to "fix" the problem.

In person interview: (Mr. Jay Douglas Harreld, Father of Matthew Harreld attended for support)

Mr. Harreld completed the accident student's commercial/multi-engine Stage 1 flight check. He completed both the initial flight check and the re-check after he failed his first attempt. Prior to

beginning the Stage 1 check flight, he briefed the accident student on the details of the flight and advised the student he would simulate an engine failure but not below 500 feet. During the flight, about 600 feet, prior to traffic pattern altitude, Mr. Harreld pulled the right engine throttle to idle. They were in a right-hand traffic pattern and had just turned right onto the downwind leg. Mr. Harreld was talking the accident pilot through the simulated failure, but the student seemed overwhelmed and was "behind the airplane." The student was veering away from the runway, the instructor asked, "where are you going?" The student inserted right aileron and said, "I can't go back." The instructor said, "my controls" and tried to correct the roll but the airplane continued to roll. The instructor pushed on the rudder pedals and realized the student still had his feet on the rudder pedals. The instructor yelled at the student to get off the controls.

On the second attempt at the Stage 1 check, the goal was to check the areas that were unsatisfactory in the student's first attempt. The student would get a simulated engine failure again. During the flight, the instructor pulled the right engine to idle. The student maintained a 15° nose-up climb, added left aileron, and did not use any rudder input. The instructor advised the student his performance was unsatisfactory and took the controls. Simulating an engine failure was a standard part of the Stage 1 check for commercial/multi-engine. He told Nathaniel Boyd, the student's primary instructor, that his student did not pass the stage check. Mr. Harreld did not have any discussion with management about the failed stage check. He advised the student to speak to Mr. Coons, and that there would be a Review Board. Mr. Harreld did not fly with the accident student again.

The check pilot's main purpose was to review and adequately document the check ride, which he did by detailing the student's inadequate performance in the student's training records. The check pilot was also responsible to tell a student's primary instructor of their performance during check rides. Mr. Harreld advised the other instructors about the student holding the controls after transfer of flight controls, but he did not recall if he mentioned that problem to management.

Mr. Harreld stated many airplanes would be squawked, then returned to service, then squawked again for the same problems. In November 2018, he sent an email to management; including Mr. Cruz and Mr. Walker, about the maintenance of N8326M that had a squawk for an oil leak. The airplane was returned to service and when it came back after another flight, he noticed the oil leak again and had to be squawked again. Mr. Harreld stated he was irritated because that meant there was one less plane to fly again. When he did some more checking into the issue, he noticed the Hobbs and tach were identical in both the first and second squawks. Mr. Harreld brought up the email and frustration with maintenance during a staff meeting; Mr. Cruz said he would personally address the issue. Mr. Cruz also responded to Mr. Harreld's email stating an actual fix would occur.

Mr. Harreld stated there were other maintenance issues. A Cessna 172, N4228Q, was squawked by a flight instructor for a rolling tendency and maintenance returned it to service. When it was flown again a couple weeks later it still had the roll tendency. He said Mr. Landon King, an instructor pilot, completed the maintenance check out flight for the roll tendency. Maintenance's response to the squawks for the roll problem was, "sometimes they don't fly straight and level." They also told Mr. Harreld that for the PA-34s, "to adjust the roll you have to adjust the flaps." There was also a double propeller strike on the accident airplane that USAG did not report. The

pilot of the airplane during the strike reported it to the company but was told the company deemed it was not a reportable event. They told the pilot it did not meet the requirements of the FAA to report.

Mr. Harreld felt there was a “normalization of deviance” regarding maintenance. For squawks, maintenance would give them “excuses” instead of fixes. There would be a lack of adequate inspection for squawks and the airplane would go back into service. An example Mr. Harreld offered was when an engine power cut during operation, instructors were told it was because pilots hold down the throttles.

When he encountered the right engine failure on the accident airplane, the engine quit 3 times during taxi performing brake checks. He heard something “not right” and moved the throttle down, that was when the engine cut. He did the same thing again after restarting and the engine cut again. The pressure on the throttle was “light” to induce power loss. Mr. Harreld said he was not going to fly the airplane with an obvious issue. He would “never take flight knowing he may be flying on one engine.”

If he asked, maintenance would tell him what they did to fix an issue. He was aware that other instructors advised management of the multiple squawks to airplanes for one problem. Mr. Harreld said he never felt pressured to fly despite a maintenance issue, nor was he questioned when he squawked an airplane. He did not believe there was animosity between the pilots and mechanics, only frustration at times.

Mr. Harreld explained that flight operations were always busy, and the school was short on airplanes. If an airplane was squawked, it went into the maintenance queue and the training flight was cancelled. To keep airplanes flying, they began the triage system to ease the burden of a squawk for a “quick fix.” Maintenance to the airplane was still supposed to be documented, which was the only way the FAA would allow the triage system. For the issue he had with the right engine dying during taxi brake check, he recalled he taxied back to maintenance and they adjusted something that fixed the issue. He did not see the triage papers.

Mr. Harreld stated it was “not often” that fundamentals [of airplane control] were off at the commercial level. The TCO outlines the standards for each lesson. In his opinion, a ‘pass’ for a lesson should not have negative comments on the lesson. There might be notes where a student could improve outside of the lesson objectives, but no negative comments on areas that were applicable to the specific lesson.

In his opinion, USAG handles “poor performers quite well.” There were a lot of resources available to help students. Mr. Harreld explained that USAG was “not allowed to terminate students, it was in their student contract.” USAG could only “recommend” termination. The only students that were usually terminated were those that did not put in the effort. The pace of the program “comes and goes” with each student, sometimes the pace was good and sometimes it was bad. Students who had weak English typically “get washed out” during their private training. When he was a Private Lead, instructors would report a pilot was not learning; sometimes due to the English barrier. USAG would work the Asian Nationals on their English when they first arrived and determined if they met the level 4 English proficiency requirement by speaking with

them during flights. For their instrument and commercial license, there were typically less issues with English.

After the student committed suicide, USAG took out language in the contract pertaining to termination of a student from the program if a student cannot perform to standards. But the review board, itself, remained in place.

Mr. Harreld felt scheduling was a problem, the TCO meant the students had to be kept on a tight schedule that was difficult to meet with the number of airplanes, pilots, and check pilots at USAG. There was no pressure from the company, the instructor had a desire to fly and keep students on their TCO. Flight instructors were capped at 5 students, and he did not feel an instructor could really manage more. Some students would wait for check rides, one student waited 102 days. There was no requirement to keep the students training, but there was pressure to get them through the next part of the TCO once back on-line with training. Mostly because it was costing USAG money if they were not keeping to the TCO.