Beyond Pilot Error: The Effects of Corporate Culture and Individual Sensemaking at Acme Community Air Service.

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ABSTRACT

In this research study we examine the corporate culture of an aviation organization and how that culture and individual sensemaking influence flight crew safety decision-making in a less-than-optimal, high-workload environment. A quantitative methodology (content analysis) and two qualitative approaches (focused and individual interviews) as well as observation are employed in the study. We conclude flight crews clearly understand the corporate cultural expectations and that such expectations frame individual sensemaking and decision processes especially when crews are faced with mission variances. The research methodology used in this study provided the researchers a rich set of data that made clearer the link between corporate culture and individual decision-making processes.

BACKGROUND

Acme Community Air Service (ACAS), Inc.[iii] is committed to providing humanitarian assistance to over 400 million people representing hundreds of people groups. ACAS has a long and distinguished history of successfully creating lines of communications by employing aircraft to reach some of the world's most needy inhabitants in over 35 countries. These groups survive in some of the most inaccessible and inhospitable regions of Africa, Asia, Eurasia and Latin America. Many suffer under oppression and lack the most basic resources. It is among the world's neediest, the "unseen," that ACAS is making a difference.

ACAS's operations are most often conducted in foreign nations where crews and staff personnel fly, maintain aircraft, and live in environmentally harsh working conditions. To accomplish its mission, ACAS owns, operates, and maintains a number of smaller single and multi-engine aircraft permitting access to remote areas that would preclude operating larger turbo-jet aircraft.

ACAS has long recognized the need for a strong aviation safety program and, in 1977, began assigning trained safety personnel at the corporate level. Its safety program has evolved over the years and ACAS has done much to develop well-trained pilots, maintenance personnel, and staff.

The organization has also designated senior, experienced pilots as instructor pilots/safety officers in various overseas operational areas where they serve as both flight and maintenance safety supervisors. Additionally, their corporate safety department conducts regularly scheduled on-site safety audits of flight, maintenance, and ground safety operations throughout its many locations. The organization has created a notable standardization and safety communications system rivaling that of commercial aviation operators in the United States.

ACAS has also made significant safety progress by modifying its aircraft to increase accident survivability for its crews. These modifications include such new technologies as "crashworthy" crew seats, modified cargo restraint systems and the latest in communication and navigation equipment. Other strides include initial and recurrent training curricula and a pilot standardization program.

The organization's safety efforts have paid off. ACAS has enjoyed a notable decrease in its accident rate five years after it instituted its safety program. However, even with such a reduction, its accident rate has continued to be a significant factor negatively impacting its operations.

[iii] Acme Community Air Service is a pseudonym for the organization depicted in this research study.

ACAS Organizational Structure

Field personnel are directly supervised and report to a "Field Director," whose responsibilities include budget control, maintenance, flight operations and scheduling, housing, safety and security (for both operational personnel and their families), and planning. Field operations may include from one to five or more aircraft, pilots, mechanics, support personnel, and indigenous workers. ACAS has created local standardization instructor pilots and maintenance staff who also report to the field director. We have designated the Field Director as "Middle Management."

Field supervisors report to regional directors who oversee numerous field operations. These upper-level managers coordinate ACAS operations and ensure compliance with corporate goals, budgets and procedures and, in this report, are referred to as "Headquarters."

Accident Reporting at Acme Community Air Service

When ACAS began its operations in a Latin American country shortly after World War II, its first airplane contacted a small hut in a village during a landing roll-out. The company's accident report stated:

> This is primarily an accident report—not for the purpose of fixing "blame" such as is common in commercial and military circle[s]—but in order that all who are interested in this field might benefit with us from the experiences which have been learned the "hard way." (ACAS President, 1946)

The language and concept communicated in the report was well-ahead of its time and would have been an excellent model for any aviation organization to emulate. Unfortunately, just a few lines later under "Cause" the all-to-familiar "Pilot error" appeared in the report and ACAS has continued to blame the pilot "such as is common in commercial and military circle[s]" (ACAS President, 1946). Thus ACAS corporate imprinting (Pettigrew, 1990) helped shaped its corporate culture[iv], and, in particular, the lens through which its members view accident causation and how members regard the role of safety and production in ACAS.

Instead of looking to individual, or pilot "error," we propose that understanding what is communicated to ACAS flight crews with respect to organizational safety expectations (culture), how that message is understood by its flight crews in the context of their individual operational environments (schema), and how that understanding influences operational decisions under anomalous operating conditions (sensemaking) will provide a more insightful explanation of accident causation (Harris, 1994; Reason J. , 2002; Hofmann, 1998; Dekker, 2001; Vaughan, 1990; Hudson; Dismukes & Tullo, 2000; Helmreich, 1994; Helmreich, Wilhelm, Klinect, & Merritt, in press).

RESEARCH DESIGN

Clearly "safety culture" in any organization is an element of "organizational culture" in which individual organization members make sense of safety and production expectations. Helmreich contends that national, organizational, and professional culture contributes to, and is implicated in, aviation accidents and organizational culture is displayed in its "…attitudes and policies regarding punishment of those who commit errors, the openness of communications between management and flightcrew, and the level of trust between individuals and senior management" (Helmreich R., 2000, p. 134). We sought to understand, interpret and evaluate the ACAS safety culture and individual sensemaking from a communications perspective because "…organization sensemaking is accomplished…and displayed communicatively" (Pacanowsky & O'Donnell-Trujillo, 1982, p. 123) and "communication is a central component of sensemaking and organizaing" (Weick, Sutcliffe, & Obstfeld, 2005, p. 413).

[iv] The researchers adopt the definition of James, James and Ashe: "…culture is engendered by system values (and involves system norms)…" (James, 1990, pg 41).

Understanding ACAS members' sensemaking required analysis of significant organizational safety communications and how such corporate communications affect not only the "way things are done around here," but how "*I* perceive things *should be* done around here" (Harris, 1994; Pacanowsky & O'Donnell-Trujillo, 1982, p. 124; Hemmelgarn, Glisson, & James, 2006; Weick, Sutcliffe, & Obstfeld, 2005).

This required a unique approach and included employing the interpretive powers of two qualitative research techniques: focused and individual interviews, and a quantitative methodology; content analysis.

Content Analysis

ACAS accident reports are made available to all members of the organization after an extensive internal analysis has been made by the safety department and corporate recommendations have been approved by the ACAS president and senior management.

Content analysis was used to identify the intended ACAS corporate safety message represented in its published accident reports. Aircraft accident reports were chosen for analysis because they are the most widely disseminated, available to all ACAS pilots via the internet, and generate significant interest among ACAS flight crews. Additionally, ACAS accident reports demand high-level organizational attention and require senior management involvement in crafting the report. All accident reports, 113 between 1984 and 2004, were selected for analysis. These years were chosen because 1984 represented the greatest decline in the organization's overall accident rate and the year it appears that ACAS's initial safety emphasis began to make a significant difference. 2004 is the last year ACAS experienced an accident.

Procedure. A content analysis protocol and coding-sheet (Appendix A) was developed by the researchers to analyze all 113 ACAS aircraft accident reports (Fiffe, Lacy, & Fico, 1998). Five analytical and administrative categories were selected and defined for analysis. The five concepts selected for study included accident attribution, mission pressure, recommended corrective action (from the organization's perspective), the importance of the flight or mission, and determination of the report writer's clarity.

Six volunteer raters analyzed the accident reports. The volunteers were trained using the protocol and coding-sheet. When the training was complete, the raters were each asked to analyze the same two randomly selected ACAS accident reports using the coding-sheet. Results from their analysis were evaluated using Krippendorff's Alpha-Reliability for inter-rater reliability (IRR) (Hayes & Krippendorff). The raters achieved an IRR 91%.

Results.

The content analysis of ACAS accident reports was revealing. Of the 113 accident reports analyzed, individual pilots (pilot error) were singled out in 49.6% of the accidents (Table 1). The reports did not hold ACAS headquarters accountable except in combination with middle management and the accident pilot and these accounted for less than 3% of the total. The total number of accidents in which the pilot was fully or partially blamed represented 79.6% of the total and when accidents attributable to external conditions or where causes were "unknown" (17 accidents) were disregarded in the total, that percentage increased to 93.8% (Table 2).

Although ACAS headquarters most often assigned "pilot error" as the causal factor in its accident investigations, the accident reports attributed most of the pressure to carry-out assigned flights to middle management (Table 3).

Who should be assigned responsibility for correcting unsafe acts, ensuring proper compliance with SOP standards, and reallocating resources to mitigate error? ACAS looks to its flight crews and local management to make corrections (Table 4).

Although ACAS headquarters controls all resource allocations for the organization, and the most senior and experienced flight instructors and flight crews are found at its center of operations, ACAS required those on the "pointy end of the spear" to solve problems that might be better addressed by organizational decision-makers in a position to provide appropriate resources and guidance.

Table 1. *Accident Attribution*

Accident Attribution				
Grouped Findings	**Percentage**	**ACAS Accident Report Findings**	**n**	**Percentage**
Flight Crew	79.6	Pilot	56	49.6
		Pilot & Operating Conditions	22	19.5
		Pilot & Middle Management	10	8.8
		Pilot, Middle Management & Headquarters	2	1.8
Management	5.3	Middle Management	5	4.4
		Middle Management & Headquarters	1	0.9
External Factors	8.8	Operating Conditions	10	8.8
Unknown	6.2	Unknown or Undiscernable	7	6.2
		Total	113	100.0

Table 2. *Accident Attribution*

Accident Attribution				
Grouped Findings	**Percentage**	**ACAS Accident Report Findings**	**n**	**Percentage**
Flight Crew	93.8	Pilot	56	58.3
		Pilot & Operating Conditions	22	22.9
		Pilot & Middle Management	10	10.4
		Pilot, Middle Management & Headquarters	2	2.1
Management	6.3	Middle Management	5	5.2
		Middle Management & Headquarters	1	1.0
		Total	96	100.0

Table 3. *Mission Pressure*

Mission Pressure				
Grouped Findings	**Percentage**	**ACAS Accident Report Findings**	**n**	**Percentage**
Management	94.7	Middle Management	100	88.5
		Middle Managemt & Pilot	5	4.4
		Middle Management & Operating Conditions	1	0.9
		Headquarters	1	0.9
Flight Crew	3.5	Pilot	3	2.7
		Pilot & Operating Conditions	1	0.9
Unknown	1.8	Unknown or Undiscernable	2	1.8
		Total	113	

Table 4. *Required Corrective Action*

Required Corrective Action

Grouped Findings	Percentage	ACAS Accident Report Findings	n	Percentage
Flight Crew	75.2	Pilot	10	8.8
		Pilot & Middle Management	51	45.1
		Pilot, Middle Management & Headquarters	22	19.5
		Pilot, Middle Management & Operating Conditions	1	0.9
		Pilot, Middle Management, Headquarters & Operating Conditions	1	0.9
Management	21.2	Middle Management	16	14.2
		Middle Management & Headquarters	7	6.2
		Headquarters`	1	0.9
Unknown	2.7	Unknown or Undiscernable	3	2.7
Missing		Missing	1	0.9
		Total	113	

Since all ACAS accident reports are generated from the headquarters (with field input), it's not surprising that, Headquarters requires itself to be part of the corrective action in only one of the recommendations and seven others when combined with middle management.

ACAS headquarters, however, is in a better position to guide production expectations and give priority to the allocation of resources that would contribute to a safer operational system and thus better support safety in the field. ACAS's current managerial approach ignores leadership responsibility for maintaining a safe system and may overlook and/or contribute to latent systemic threats.

The message is clear. As reflected in its accident reports, ACAS's cultural norm or organizational expectation is that blame for mishaps lies principally with its pilots and middle management. This organizational expectation is consistent with the philosophy of its founders and has been repeatedly reinforced over the years through its accident reports.

ACAS field employees should anticipate that if they are involved in a mishap, they will be blamed, and the organization will expect them and their field manager to "solve the problem." Though the SOP may state that implementation of "safety programs, practices and oversight" is the responsibility of ACAS management, the organization's actions define "management" as the accident crew and first level supervisor.

A third cultural expectation is that resources required for maintaining a safer operational environment must be generated at the lowest organizational levels. This is evidenced by its requirement that organizational safety program failures (accidents) be addressed and solved at the field level. This cultural "norm" is further reinforced by the lack of ACAS headquarter support for common industrial safety equipment as well as the organization's inattention and inability to defend against, trap, or mitigate the effects of even the most fundamental threats to worker safety.

SENSEMAKING

Simply put, sensemaking is an individual "making sense" of situational anomalies occurring in organizational life. Sensemaking aids in managing ambiguity, allowing "interdependent people [to] search for meaning, settle for plausibility, and move on" (Weick, Sutcliffe, & Obstfeld, 2005, pg 419; Dougherty & Drumheller, 2006; Mills & Weatherbee, 2006).

How do ACAS flight crews make sense of organizational norms when carrying out operational flights? It can be argued that any routine commercial flight operated in highly-developed aeronautical systems, under familiar operating conditions, and with the best of pre-flight, enroute and post-flight resources, is unique and poses unique and diverse threats to crew safety. However, ACAS crews most often

operate in non-RADAR environments without the advantages of weather reporting systems while performing takeoff and landing operations on undeveloped landing strips that require specialized training. Mission variance and in-flight irregularity is the norm. Each crew must not only consider individual aircraft capabilities, his or her own physical state, but make sense of a constantly changing in-flight environment especially when unknown or un-forecast weather conditions are encountered or aircraft abnormalities unexpectedly occur.

Under such circumstances, how do crew members make sense of ACAS organizational mission and safety requirements? How organizational culture affects sensemaking requires, according to Harris, recognizing the role individual schemas play in sensemaking. Schemas are those

> …dynamic, cognitive knowledge structures regarding specific concepts, entities, and events used by individuals to encode and represent incoming information efficiently. Schemas are typically conceptualized as subjective theories derived from one's experiences about how the world operates that guide perception, memory, and inference (pg 310).

Harris identifies five culturally relevant schemas[v] that guide individual interpretation of external organizational cues. Such cues can have common interpretations among groups because of shared experiences, well-organized lines of communications, and because "individuals value the ability to predict and understand their circumstances that a shared conception of reality makes possible" (pg 313).

ACAS FOCUSED AND INDIVIDUAL INTERVIEWS

How crew members perceived the ACAS corporate safety message was accomplished through focused and individual interviews. This methodology was chosen because the crew members are not only intimately acquainted with ACAS culture, they have shared corporate knowledge, understanding and experiences. Members of focused interviews can be stimulated to share personal observations and experiences by other members and, through discussion, mutual support as well as deliberation, can reveal shared schemata (Merton, Fiske, & Lendall, 1990; Morgan, 1997; Lindlof, 1995, pg. 3).

While focused interviews are clearly an excellent qualitative method, they may create an "unnatural social" setting for the participants. Such an environment may suppress individual members' willingness to share opinions and experiences. In order to mitigate any group member inhibitions, we also conducted individual open-ended interviews. Employing both methodologies facilitated cross-referencing and data triangulation (Morgan, 1997).

ACAS employs 176 flight crew members. We conducted five focused interviews representing large, medium and small operations located in three national sites. The interviews were attended by current ACAS flight crew members and represented a sample population of 42 (24% of the total ACAS flight crew population). The researchers were limited to particular geographic areas and could only travel with ACAS personnel during headquarters scheduled visits. The sample population, therefore, was chosen based on a non-probability, convenience sampling technique (Creswell, 2002, pg. 167).

The focused interviews represented bases of operations ranging from one pilot and aircraft to ACAS's largest operation employing numerous pilots, support personnel, and aircraft. One focused interview was conducted at the ACAS United States Operations Center (USOC) during a scheduled pilot-refresher training course. All interviews were taped (with the permission of the participants) and transcribed. All participants were promised anonymity and understood that any identifiable comments would not be shared with ACAS administration. All interview transcriptions were de-identified.

Three other focused interviews were conducted at ACAS headquarters. The first was

[v] Self Schemas (self-in-organization), Person Schemas ("other" person(s)-in-organization), Organization Schemas (cultural manifestations in groups of others), Object/Concept Schemas (organizational semiotic communication), and Event Schemas (event-in-organization) (pg 311-313).

with ACAS senior administrators and the second was with a class of newly recruited pilots while the third interview involved the new pilots' spouses. The newly hired pilots and their spouses had just completed most of the ACAS indoctrination class and had not yet been assigned to a field of service.

Procedure. An interview guide was created prior to the first focused interview and was consistently used throughout subsequent interviews. Four criteria[vi], developed by Merton et. al., for conducting an "effective" focused interview were used to develop the interview guide (1990, pgs. 11-12; Morgan, 1997, pg 45).

Transcripts were coded using the NVivo 7 qualitative data analysis program (QSR, 2006). The software allowed the data to be analyzed employing a cross-case strategy and easily permitted either a variable-oriented or case-oriented analysis. This approach made it easier to understand, generalize, and explain the data (Miles & Michael, 1994, pg. 173).

While the unit of analysis for focused interviews is generally considered the "group," it can be argued that such analysis must also consider the relationship and interchange between group members. In other words "…we must recognize not only that what individuals do in a group depends on the group context but also that what happens in any group depends on the individuals who make it up" (Morgan, 1997, pg 60). Morgan further argues that the three most common focus interview coding methodologies[vii] are "…actually nested within each other because coding all mentions of a topic will also determine whether that topic was mentioned by a specific individual or in a particular group" (pg. 60).

Since the goal is to understand, from the flight crew's perspective, how crews conceptualized what is important to ACAS as it related to flight operations and safety (culture), the focused interview, then, is particularly useful in that it reveals not only individual, or "self schemas," but provides the researchers with insight to "person schemas" (person(s)-in-organization) and "organization schemas" (Harris, 1994, pg 312). If such schemata are common to groups, then they represent "shared experiences and shared exposure to social cues regarding others' constructions of reality" (pg. 313) and become manifestations of corporate culture.

RESULTS

Why ACAS? When operational pilots in focused interviews were asked to describe why they considered and ultimately chose to work for ACAS, their responses were reduced to the following four categories:

1. ACAS Operates Safely
2. ACAS Cares For Its Staff
3. ACAS's Purpose
4. ACAS Operates Technologically Advanced Aircraft

Of these categories new pilots and their spouses (two focused interviews) mentioned their belief that ACAS operates safely 49 times during the interviews (pilots: 32, spouses 17) while experienced ACAS pilots and the those in senior management (four focused interviews) spoke most about ACAS's purpose, or mission, as being their reason for choosing ACAS. (Tables 5 & 6)

Safety at ACAS. When asked to describe safety and ACAS, groups framed safety in terms of flight and the ACAS mission. Organizational cultural issues as well as organizational communications were also topics of discussion among the groups.

Safety and Mission. Tension between safety and mission at ACAS generated most of the responses in both the pilot's groups and senior management while among the new pilots it wasn't mentioned at all.

[vi] An effective focused interview involves: 1) Range—allowing interviewees freedom to explore a large scope of subjects. 2) Specificity—provides specific data. 3) Depth—creates a climate that reveals the participant's meanings and perspective. 4) Personal Context—the context in which personal beliefs and perspectives are revealed.

[vii] Coding: 1) All mentions of a given code. 2) Individual participant mention of a given code. 3) Group mention of a given code (Morgan, 1997, pg. 60).

Table 5. *New Pilots and Spouses. Why Did You Choose ACAS?*

New Pilots and Spouses Focus Interview Groups: n=2		
Data Reduction	*Responses (n)*	**Percentage**
ACAS Operates Safely	49	80.3
ACAS Cares For Its Staff	4	6.6
ACAS's Purpose	7	11.5
ACAS Operates Technologically Advanced Aircraft	1	1.6
Total Responses	61	100.0

Table 6. *ACAS Senior Management and Pilots. Why Did You Choose ACAS?*

ACAS Senior Management and Pilots Focus Interview Groups: n=4		
Data Reduction	*Responses (n)*	**Percentage**
ACAS Operates Safely	1	2.3
ACAS Cares For Its Staff	3	6.8
ACAS's Purpose	39	88.6
ACAS Operates Technologically Advanced Aircraft	1	2.3
Total Responses	44	100.0

Table 7. *ACAS Pilots - Safety at ACAS*

ACAS Pilots (Three Focus Groups)		
Data Reduction	*Responses (n)*	**Percentage**
Safety and Mission	70	57.4
Organizational Culture	49	40.2
Organizational Communications	3	2.5
Total Responses	122	100.0

Table 8. *Senior Management - Safety at ACAS*

Senior Management		
Data Reduction	*Responses (n)*	**Percentage**
Safety and Mission	41	65.1
Organizational Culture	13	20.6
Organizational Communications	9	14.3
Total Responses	63	100.0

Focus groups described safety and mission (organizational purpose) in terms of "tension" or "pressure." Tension was mentioned 18 times in descriptions of flight operations, resources, and safety and, within the same context, pressure was expressed nine times. Many pilots expressed their opinion that the conflict between operational requirements and safety were rooted in a lack of resources and local budget concerns. Likewise, fatigue was correlated by some of the participants with scarce resources.

Not all agreed. Some believed that tension between operational necessity and safety was "healthy" while others expressed the tension or pressure as an internal phenomenon.[7]

Mention and discussion by the participants of tension and mission pressure, whether internal, external, or "healthy" demonstrates Harris's "self schemas," "person schemas" (person(s)-in-organization), and "organization schemas" that fit the corporate cultural message transmitted in ACAS accident reports. The accident reports reinforce the fact that the ACAS Corporate offices will hold local (field) units accountable for deviations from its SOP and, according to the pilots we interviewed, perceive that ACAS is placing them in a position that creates pressure to get the job done and do so without error. In the words of two pilots:

> (Focused Interview) I agree with the fact that as technicians and we basically are task-oriented people and the pressure to get a job done is there for sure. I think just in the type of personalities that lend themselves to being [humanitarian] pilots. You've got a child out there that's burned or whatever and you may push yourself into a situation that you might not normally put yourself into, just based on the fact that you want to help and serve, you want to… I'm not saying that that's all that bad really…Well maybe the situation needs to be pushed because it is an emergency. You did what you could do up to the limits of both your understanding of your limitations and the aircraft's limitations and as far as the limitations that we have placed upon us by ACAS, you can go right up to those limitations and still try to, you know…. But you do get pushed (Johnson & Stobbe, 2005).
>
> (Individual Interview) And there are all kinds of different…pressure[s], and some of them are invented by us, some of them aren't. Sometimes we come up with our own internal pressures… "Well, it'd be really nice if I could do this," for example "I've already done 8 landings, and I'm going to be squeezing it in today if I get this done, but if I take this extra 50 kilos now, then I wouldn't have to come back here in the afternoon, and that would cut me down to 6 landings, and then I know I could make it home easy (Johnson & Stobbe, 2005).

Most ACAS pilots we interviewed are motivated to complete assigned missions and they are well-aware of the risk, challenging operational flight conditions, and ACAS's humanitarian purpose. Their desire to accept the risk and challenge works itself out into a "can do" attitude that is amplified by ACAS's cultural norm of personal as opposed to organizational responsibility and accountability. (Table 6)

Reinforcing cultural norms of "mission" and "safety" as separate or mutually exclusive concepts creates tension as flight crews attempt to balance conflicting requirements. Clearly both are required to effectively and successfully complete individual missions and ensure the long-term viability of ACAS, however, ACAS pilots we interviewed were quick to explain to us; "Safety is important," but then, "…you've got a flight ahead of you that's been scheduled, you're expected to do it, um, that's what you're there to do, so it's go, go, go, get it accomplished, let's get the task done, do it well" (Johnson & Stobbe, 2005).

Such cultural norms are indicators of what Westrum would term a "Bureaucratic" culture. Bureaucratic organizational cultures tend to reduce responsibilities for misadventures at the lowest bureaucratic levels and require that solutions and fixes be completed at the same level. A healthier approach represented in a "Generative" or high-reliability organization,

[7] De-identified responses are available from the researchers.

tends to view such accidents as systemic failures requiring organizational support (Reason, 2002, pg. 38; Westrum, nd.).

Senior ACAS administrators described organizational "tension" in terms of budgets and personnel resources as well.[8] Such pressure is communicated throughout the organization and creates additional stressors on pilots operating in the field. At the same time most senior administrators believed that pilot standardization, training, and reinforcing SOP requirements would mitigate the additional organizational pressure placed upon individual pilots and local ACAS managers. Senior ACAS decision-makers clearly place not only decision-making authority at the field level; they hold field managers accountable as though they are separate corporate entities while providing little management training or support.

Comments made during the senior management focused interview summed up ACAS Headquarters perspective on responsibility and accountability and the organization's belief that an appropriate and effective safety program can and should be built around its SOP.

> But we try to do it exactly and it's unavoidable [tension]. I don't think you were here … when we talked about a pilot that's in a war situation, has a lot [of] tension, but there is still an expectation that they have to fly. Our challenge is to equip them [ACAS Pilots] in order to manage the tension and equip them for that.
>
> I remember a communication that came out from the presidents' office following an accident. And it had a statement [emphasizing following SOP guidelines]. And I think some of our guys were thinking, "I know the book says this, but to get the job done I really got to push that aside even though, even though the conditions are favoring for it."
>
> The [ACAS pilots] will operate by the [SOP]…, or they won't be operating. So that kind of broad statement covers everything but how it is communicated? It's communicated from every level hopefully consistently the same message. That we want to standardize, we want to keep you guys safe.

Operating guides and SOPs are important and foundational to any organization and the message that ACAS wants to "keep you guys safe" is appropriate. But relying on written standards and a standardization program alone may create what Reason would label "Dangerous Defenses"—defenses that actually "set-up" organizational failure and do little to focus investigation on latent systemic threats and underlying causes of accidents (1997).

CONCLUSION

What's important to ACAS? Simply put, it's "Mission first." How does this corporate cultural norm work itself out in how individual crew members make sense of corporate expectations? Based on focused interviews, ACAS pilots understand they are responsible for carrying out the mission and there is little tolerance for deviations, mishaps, and accidents. This is an organizational, or ACAS cultural norm and it is clearly communicated through its accident reports and understood by its pilots. From senior management to pilots in the field, schemas and cultural expectations are congruent and consistent. Such corporate expectations are not evident in the new pilots we interviewed. In fact tension between "mission and safety" was not a topic of discussion among the ACAS nascent aviators. As these new pilots become acculturated it is likely the organization's culture of "mission first" will become salient and cue personal schemata of service (Table 5) creating the "tension" that currently exists in ACAS flight crews and senior management (Harris, 1994, pg 314).

Organizational stressors[9] such as tension (conflicting safety and mission expectations), conducting flight operations in less-than-optimal conditions (although typical for ACAS pilots), and requiring its flight staff to perform

[8] De-identified responses are available from the researchers.

[9] Stressors are rooted in organizational culture and, depending upon the individual, may create stress (Beehr, 1991).

additional organizational duties contributes, in varying degrees, to individual stress and fatigue. Both stress and fatigue are implicated in poor in-flight decision-making, incidents, and accidents (Trollip & Jensen, 1991; Orlady & Orlady, 1999; National Transportation Safety Board, 2002; Aarons, 2003; Human fatigue bigger risk to safety than realized, 2004).

ACAS flight operations most closely parallels corporate flight operations. A NASA study, "Crew Factors in Flight Operations XIII: A Survey of Fatigue Factors in Corporate/Executive Aviation Operations" reported that corporate pilots described slow reaction times, decreased alertness, loss of situational awarness, and slowed perception were the results of fatigue. What were the factors that caused fatigue in the corporate flight world? Long duty days, multiple flight segments, and workload were some of the issues raised by corporate pilots. Corporate pilots do not have the added stress of flying into and out of primitive grass airstrips (often more suitable for helicopter operations) as do those working for ACAS. Most executive flight crew are housed in up to date, air-conditioned offices with modern equipment. Yet these same flight crews reported that additional duties including aircraft maintenance, flight planning, dispatch duties, and baggage handling created flight-crew fatigue (Rosekind, Co, Gregory, & Miller, 2000). Such duties are carried out by ACAS personnel as well and, in addition, they may be charged with hangar and personal housing maintenance, base supervisory oversight, information (IT) and communications maintenance, and administrative duties (Johnson & Stobbe, 2005).

In the words of one accident pilot:

> No, I'd say [the work days] were pretty average as far as working here in the hangar. My problem is that I'd get home having received a couple of [requests] from [customers] whose email wasn't working…Ok, for the month of June, I think it was, the accident was in the beginning of August, but for the month of June we had two information technology interns here that were supposed to come… the initial idea was for them to come and install a new HF radio email system. Well, as it turns out they were only going install a new phone email system and we don't… I think we had nine users, all of us plus two [customers] in town, and it involved learning a whole new system – a Linux system. And so I had to do study time and work time with them on the [IT] hub, during the day and so there were days when I didn't fly and had to do that. I did make some flights bringing these guys out to some stations where they could check the software and install some new stuff and see if they could get the HF [high-frequency] system going better. And those flights went well. I dealt with some weather on a couple of them and didn't have any problems with that. I felt that my flying was good. I didn't feel that I was cutting anything short or hanging on by a thread or anything like that. But I do admit that I was getting tired, especially the week before the accident and there were I think there were three nights that I was up to 11 o'clock or later working on the system (Johnson & Stobbe, 2005).

"The role of workload in fatigue is complex," NASA reported, "and not clearly defined. However, anecdotal evidence and common sense suggest that higher workloads by contribute to fatigue, particularly over the course of a long duty day" (Rosekind, et. al, 2000, pg. 21).

"Pilot Error," most often the conclusion of ACAS aircraft accident investigators, ignores the effect of corporate expectations placed on flight crews. ACAS expectations (production and safety) are clearly understood by its crews and when those crews are faced with decisions that impact those expectations, ACAS should anticipate most of its crew members, based in individual sensemaking shaped by those cultural expectations, will make choices that place mission ahead of safety.

APPLICATION

The qualitative and quantitative approaches used in this research study have application both in aircraft accident investigation and, more

importantly, before such accidents occur. Our methodology sheds light on the effect of corporate culture and how that culture is communicated and interpreted by its crewmembers. This proactive approach provides decision-makers with the tools they need to make appropriate and responsible safety and production decisions while identifying systemic errors that set crews up to fail that are often masked by the all-to-familiar “pilot error.”

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APPENDIX A

Content Analysis Protocol

Introduction

This is a content analysis of the published accident reports of Acme Community Air Serve (ACAS) from 1982 to 2001. We want to understand where ACAS typically places responsibility for its aircraft accidents. The following definitions are important in selecting and analyzing the content under study.

Procedure

1. *Source:* Code this field with the last two digits of the accident year followed by a dash (-) and the report number. For instance report 7 for 1983 would be coded 83-7.

2. *Accident Attribution:* For the purpose of this study, accident attribution refers to responsibility for the accident. Responsibility is defined as: Answerable, accountable (to another for something); liable to be called to account. Accident attribution has four possibilities; the crew member, ACAS middle management (Field Director), ACAS Headquarters and/or conditions beyond the control of ACAS such as un-forecast weather. Attribution of responsibility may be placed in one or more of the categories.

    a. *Total* means total responsibility can be placed in that category.
    b. *Partial* denotes responsibility can be divided among more than one category.
    c. *Unknown* signifies that the accident report does not clearly attribute responsibility to any category.
    d. *N/A* means the accident report clearly does not attribute responsibility to any category.

3. *Mission Pressure*. Mission is defined as; A task which a person is designed or destined to do; a duty or function imposed on or assumed by a person; a strongly felt aim or ambition in life. Also; determined to achieve a goal, complete a task, fulfill an obligation, etc. Pressure means the action of moral or mental force, or of anything that influences the mind or will; constraining influence; to bring pressure (to bear): to exert influence to a specific end; to bring (or put) pressure on (someone): to urge or press (someone) strongly in order to persuade.

    Mission pressure then describes the real or perceived pressure, from ACAS management or the pilot, to begin, continue and/or complete the assigned mission. Assignment of the source of pressure can come from four possible sources; the pilot, ACAS middle management, ACAS Headquarters and/or conditions beyond the control of ACAS such as un-forecast weather. Attribution of may be placed in one or more of the categories.

    e. *Total* means 100% of the mission pressure can be placed in that category.
    f. *Partial* denotes mission pressure can be divided among more than one category.
    g. *Unknown* signifies that the mission pressure cannot be clearly attributable to any category.
    h. *N/A* means the accident report clearly does not consider mission pressure.

4. *Corrective Action.* These are recommended actions to be completed by either the pilot, middle management or ACAS headquarters (includes ACAS Safety Department). The report may suggest actions be completed by more than one level of management. Such required actions are generally listed under “recommendations” in the accident report.

i. *Total* means that category is to complete all recommended actions.
j. *Partial* denotes the report requires more than one category to complete corrective action(s).
k. *Unknown* signifies that required actions cannot be clearly attributable to any category.
l. *N/A* means the accident report clearly does not require corrective actions. e.

5. *Mission Importance*. Code this according to the purpose of the flight.
   m. *Administrative*. Means the flight is in support of ACAS operations. Examples would include flights to transport ACAS officials and visitors, transport supplies and maintenance flights.
   n. *Training*. Pilot proficiency, check rides and in-country checks fall into this category.
   o. *Routine*. Scheduled ACAS flights in support of customers, government or indigenous peoples.
   p. *Emergency.* Emergency flights for medical or political reasons.

6. *Writer's Message*. Was the accident report:
   q. *Clear*. Easy to understand, fully intelligible, free from obscurity of sense, perspicuous.
   r. *Ambiguous*. Admitting more than one interpretation, or explanation; of double meaning, or of several possible meanings; equivocal.

Pilot (PT)	**1**
Middle Management (MM)	**2**
ACAS Headquarters (MH)	**3**
Operating Conditions (OC)	**4**
PT + MM	**5**
PT + MH	**6**
PT + OC	**7**
PT + MH + OC	**8**
PT + MM + MH	**9**
PT + MM + MH + OC	**10**
MM + MH	**11**
MM + OC	**12**
MM + MH + OC	**13**
MH + OC	**14**
UNK	**15**
N/A	**16**

1. Source _____

2. Responsibility

	Total	Partial	Unknown	N/A
Pilot				
Middle Management				
ACAS Headquarters				
Operating Conditions				

3. Mission Pressure

	Total	Partial	Unknown	N/A
Pilot				
Middle Management				
ACAS Headquarters				
Operating Conditions				

4. Corrective Action

	Total	Partial	Unknown	N/A
Pilot				
Middle Management				
MAF Headquarters				

5. Mission Importance

Administrative	
Training	
Routine	
Emergency	

6. Writer's Message

Clear	
Ambiguous	