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FORUM

ALTERNATIVE PARADIGMS FOR STRUCTURING COLLEGIATE FLIGHT PROGRAMS

Rodney O. Rogers

ABSTRACT

Collegiate aviation programs traditionally have been modeled on industry flight training programs, as exemplified by the U. S. Military and the airlines industry. Recently, university administrators have been urging a shift in such programs to a more conventional academic paradigm where faculty are required hold doctoral degrees and to publish regularly. Such a transition may not succeed for a number of reasons, including the fact that faculty in aviation programs with extensive experience flying heavy aircraft typically do not hold the PhD degree and often have little or no interest in publishing scholarly papers. At the same time, the need to conduct funded research in aviation universities cannot be ignored. A possible solution to these contradictions lies in allowing some faculty in collegiate programs to teach and provide service to the university, which encouraging others so inclined to accept reduced teaching and service loads in exchange for pursuing and obtaining funded research grants.

The Fall 2002 issue of *JAAER* contains a thought-provoking article where Don Smith argues that requiring faculty in degree-granting collegiate flight programs to have doctorates and to “publish or perish” will precipitate the demise of such programs. Mandating such requirements, Smith believes, will alienate faculty with highly desirable heavy aircraft experience but with little or no interest in what universities traditionally categorize as research. Unable to be tenured or promoted, current faculty members of this ilk either will be terminated or will seek employment outside the university. Similarly qualified individuals desiring to replace those who leave will be unable to meet entry-level requirements, or will find the mandate to earn a doctoral degree and to publish a disincentive to accepting employment in the first place.

When collegiate aviation programs change in this direction, Smith believes, they flounder. At the same time, he seems to acknowledge that these programs are destined to undergo change. Underlying his insights is the fact that a paradigm shift has been underway for some time in the Aeronautical Science Department at Embry-Riddle Aeronautical University’s Daytona Beach, Florida campus, where Smith teaches. Events unfolding in this department, often acknowledged as best of its kind in the world, provide an excellent—one might argue unique—opportunity to examine if and/or how change for the better might occur in collegiate aviation departments. This is a topic that Smith raises by implication but leaves unexamined.

What follows discusses alternative paradigms for structuring aviation flight training programs in a

university, with emphasis on what is currently transpiring at Embry-Riddle. I will evaluate three paradigms: the *industry* paradigm, the *university* paradigm, and the *hybrid* paradigm. In my judgment, only the latter will serve Embry-Riddle Aeronautical University well in the short term, and probably in the long term as well.

THE INDUSTRY PARADIGM

The industry paradigm is based on pilot training programs of the United States military and of American airline companies. In these programs, aviators previously trained in the same system conduct both in-flight and classroom-based instruction. These individuals hold bachelors degrees; a few in management positions—mainly in airline companies—may have earned a masters. Some narrowly technical subjects—airplane-model-specific hydraulic, flight control, or electrical systems, for example—may be taught by technicians who lack a bachelors degree but whose significant on-the-job maintenance experiences and demonstrated verbal skills qualify them for their jobs as instructors.

Embry-Riddle Aeronautical University emerged in the 1960s, when its first president Jack Hunt—an acclaimed Naval Aviator, Distinguished Flying Cross recipient, and Harmon Trophy winner who significantly never earned a doctoral degree—purchased Embry-Riddle, moved it from Miami to Daytona Beach, and converted it from a flight-training organization to a degree-granting technical university. From the university’s inception, Riddle’s largest degree program—Aeronautical Science, in

Alternative Paradigms

the College of Aviation—has been organized on the industry paradigm. Academic flight-related subjects such as aerodynamics, aircraft performance, systems and components, global navigation, etc. are taught by faculty in the Department of Aeronautical Science who are required to have at least a masters degree. Airplane-based flight training is provided by the Flight Department, where instructors of course hold appropriate FAA ratings but are not required to have an advanced academic degree, or indeed even a bachelors degree.

The acknowledged excellence of the Embry-Riddle Aeronautical Science degree program is bifold. Flight training in the Riddle Flight Department is superior to fixed-based operations training because of instructor and curriculum standardization, and because of the department's emphasis on flight safety and high quality aircraft maintenance. However, the excellence of academic courses in the Aeronautical Science Department is what most clearly differentiates the Aeronautical Science degree from non-collegiate flight training. Successful graduates complete many upper level aviation classes in order to earn an Aeronautical Science degree, and these classes probe their subject matter in greater detail than do analogous classes in the world's best flight training institutions. As an example, courses I habitually teach—Basic Aerodynamics, Aircraft Performance, and All Attitude Flight and Upset Recovery—are based on classroom and in-flight training I received as a United States Naval Aviator, supplemented by simulator time I have logged at various airline companies. However, Riddle's versions of these courses are more detailed and better than the Navy's, because the Aeronautical Science curriculum devotes far more classroom hours to each subject than the Navy does. Equally important, our faculty on average are better qualified—I think—than their Navy counterparts. In short, Riddle's classroom aviation training is even better than the Navy's. It certainly follows that civilian pilot training at fixed-based operations is in no way comparable to the education an Embry-Riddle Aeronautical Science major receives.

When the Aeronautical Science Department was first instituted, faculty were primarily retired military aviators with master's degrees. These individuals were "special" among aviators in that, in addition to extensive heavy aircraft experience, they had a great love of academic aviation and—by virtue of their military retirement pay—were financially able to accept the meager salaries which the university initially paid. In the 1980s, salaries improved somewhat, though they are still no higher than those paid to experienced local high school teachers.

Today, the department still has a large contingent of ex-military aviators: However, the faculty now also

includes a number of general aviation pilots, most of whom built significant flight time as Riddle flight instructors while completing an advanced degree at the University. Some of these have a knowledge of swept-wing jet-power airplanes gained through airline simulator training. Finally, five current faculty are ex-airline pilots, individuals who either retired at age sixty, or who left the industry as a result of medical problems or because their airline companies failed financially. Four of these ex-airline pilots are also ex-military aviators. These individuals with both military and airline experience are arguably the most valuable members of our faculty. Not one of the four, however, has a doctoral degree.

Today as in the past, flying experience is what gives Aeronautical Science faculty authority and credibility in the classroom. Their university degrees make them acceptable to accreditation authorities. Often, however, these degrees are in subjects unrelated or marginally related to aviation. In addition, when one asks what advanced academic degrees might be relevant to teaching people how to fly, the sole answer seems to be aeronautical engineering. Academic education surely improves the mind, but technical training and heavy aircraft experience is what Aeronautical Science faculty need to succeed, coupled of course with verbal skills and a strong desire to help aspiring pilots prepare for an exhilarating career in aviation. As an example, though I hold several academic degrees beyond the bachelors, what best qualifies me to teach subjects such as aerodynamics or performance is undergraduate work I completed in engineering math and physics, together with what I learned from Navy flight training and from fourteen years experience flying swept-wing jet airplanes. Completing advanced degrees in English Literature and in Computer Science improved—I hope—my ability to think and write clearly. In addition, I very much enjoyed participating in these educational programs. (Indeed, I would be a professional student if only the salary were higher.) However, the combined subject matters of English and Computer Science provides very little knowledge to support my teaching in the field of Aeronautical Science.

The historical success of the Embry-Riddle Aeronautical Science program argues strongly in favor of the industry paradigm. This is the sum of Don Smith's recent paper in *JAAER*. What has worked in the past is best, Smith believes. There is no need to fix something that is not broken. Nevertheless, the industry paradigm probably will no longer suffice at Riddle and in other collegiate aviation programs, if only because academic administrators—for better or worse—are intent upon change.

THE UNIVERSITY PARADIGM

The university paradigm is the one traditionally used in research universities in the United States and abroad. An entry-level faculty member is expected to hold a doctoral degree in his or her teaching field. Assistant professors are hired on an "up-or-out" basis; i.e., after an interim period, usually six years, they either are tenured—and ordinarily promoted to the rank of associate professor—or else must leave the university and seek employment elsewhere. Tenure and promotion decisions are based on perceived excellence in teaching; on service to one's academic department, the university, and the community; and on research and scholarship. Perhaps because teaching effectiveness is very difficult to evaluate, and service requirements relatively easy to satisfy, research/scholarship becomes a *sine qua non* for tenure and promotion. Ordinarily one must produce a number of "quality" publications which appear in professionally acceptable venues. Such articles or books—"refereed" or "juried" by senior scholar's in one's academic field—imply that a junior faculty member measures up to currently accepted intellectual standards. In fields where research money is available, one should add, publications emanating from funded research are valued most highly of all, since the research then contributes to the financial well being of the university.

Until recently, Embry-Riddle considered itself an undergraduate teaching institution. Only a small number of the faculty held doctoral degrees; fewer still were conducting research or publishing. Then in the early 1990s, the University—at the insistence of an Academic Vice President serving under the university's third president, Steve Sliwa—instituted an up-or-out tenure policy, together with the stipulation that a terminal degree and publications are prerequisites for tenure and promotion. This policy has not been greeted favorably in all quarters. In some departments—probably in most—many currently tenured faculty do not hold the doctorate. In addition, the teaching load at Riddle is 12 semester hours—four courses—which some people believe places demands on faculty time which militate against demands for publication. In every department one finds a number of tenured full and associate professors who readily admit they could not be tenured or achieve their current rank under the new promotion/tenure guidelines. Indeed, one sitting high-level academic administrator is an individual who does not have a doctorate and who hence does not meet the current entry-level requirements for his academic department.

Nevertheless, the new tenure/promotion policy is slowly gaining favor, and ultimately it is likely that the university paradigm will prevail at Riddle, probably for the long-term benefit of the university. The paradigm shift is

possible because large research universities produce PhDs in sufficient numbers to make teaching jobs in undergraduate institutions such as Embry-Riddle attractive to their graduates. Many Riddle academic departments—Human Factors, Engineering Physics, Humanities and Social Sciences, and Aviation Business Management, for example—have recently been moderately successful in hiring entry-level faculty with doctoral degrees. In fact, in some of these disciplines, a faculty appointment represents the primary or even sole employment opportunity for a new PhD. By contrast, some Riddle departments—Computer Science is one—have been unable to attract PhDs at salaries which the university can afford, because job opportunities in industry are too numerous and far too attractive economically.

Another department with very limited success in attracting qualified faculty with doctorates is Aeronautical Science. Ironically, the reason is still related to the supply and demand of PhDs: there is essentially no supply for the discipline of Aeronautical Science. Nowhere in America does there exist a doctoral (or even a masters) program built on the undergraduate discipline of Aeronautical Science as taught in collegiate aviation programs. In point of fact, no PhD or EdD program teaches what a faculty member needs to know to serve in the Aeronautical Science Department at Embry-Riddle. Nevertheless, for the past ten years academic administrators—mindless of the needs of the department and the realities of commercial aviation, according to some Aeronautical Science faculty—have urged the department to conform to the university paradigm. In response, the department has made a good-faith effort to hire individuals with doctoral degrees, attempting to ensure at the same time that such individuals have experience flying heavy aircraft, preferably swept-wing jets. The results have been less than encouraging because aviators earn their "advanced" degrees not in academe, but in the skies and in heavy aircraft training programs structured on the industry paradigm.

To appreciate the difficulty of hiring constraints imposed by the university paradigm, consider the demographics of the Embry-Riddle Aeronautical Science Department in Daytona Beach. There are currently 28 faculty members. Of these, one is the recently hired department chair who teaches only one course per semester, while a second fills an endowed chair and focuses primarily on research and other non-teaching activities. The other 26 "teaching" faculty carry full time teaching loads of 12 semester hours. Many carry course overloads because the department is currently understaffed, having experienced difficulty in obtaining additional faculty lines and hiring qualified faculty. Statistics that follow take into account only these 26 teaching faculty.

Alternative Paradigms

A typical member of the current department has significant military and/or commercial aviation experience. Of 26 teaching faculty, 18 (69%) have 500 hours or more of heavy aircraft flight time. The percentage of faculty with some heavy aircraft experience rises to 81% if one includes in this group three of four high time general aviation pilots—former Riddle flight instructors—who have earned university-funded ATP ratings from airline flight training departments. (The fourth also has military heavy aircraft crewmember experience.) Sixteen (62%) of the 26 teaching faculty are ex-military, i.e., 89% of the individuals with extensive heavy aircraft experience gained it in the military. From these figures, two conclusions follow. First, the department places a high priority on hiring faculty who have heavy aircraft experience. Second, the military is a fertile source of such faculty, especially since many retired military aviators already have a masters degree in some field, a virtual requirement for continued promotion in the various Officers Corps of today's military.

Now consider degree credentials held by teaching faculty in the Aeronautical Science Department. Accreditation agencies mandate the masters, but in fact the department has always attempted to hire individuals with doctorates, assuming of course that such candidates also have appropriate real-world aviation experience. Since the university paradigm has been in effect at Riddle, the search for faculty with doctorates has been especially concerted. Nevertheless, only five of 26 teaching faculty (19%) hold the doctoral degree. Moreover, only three of these five have heavy aircraft flight time; i.e., only 12% of full time teaching faculty have both a doctoral degree *and* significant heavy aircraft experience. Another way of stating this contrast is that close to three-quarters of the current teaching faculty have significant heavy aircraft flight time, well less than one-fifth of this three-quarters also hold a doctorate. If one grants that Aeronautical Science is a field where heavy aircraft experience is mandatory for a large majority of the faculty, these ratios present a conundrum to administrators who would hire qualified faculty while attempting to conform to the university paradigm.

One sees similar demographics looking just at full-time teaching hires in the last ten years, i.e., beginning from the time the university paradigm began to gain credence. During this period, Riddle flight instructors unionized and several individuals long employed by the university moved from the Flight Department to Aeronautical Science. Including those who entered from Flight, the department hired 12 new teachers. Of these, nine (75%) have heavy aircraft experience, about the same as the overall departmental average. Seven (58%) are ex-military, compared with 62% of ex-military in the department as a whole. Three of the new hires (25%) hold

the doctorate, a slight improvement over the average of 19% doctorates among all departmental full time teaching faculty.

When one considers the credentials of individuals hired within the past five year—a period when Riddle administrators have very strongly urged the Aeronautical Science Department to conform to the university paradigm—the situation is not more encouraging. I will omit individuals transferring from the Flight Department and consider only the six faculty hired from outside the university. Of the six, three have a doctoral degree, while a fourth is a doctoral candidate. Of these four, one is a retired airline captain, an extremely rare trophy almost never captured in a university environment. Only one of the other three doctoral hires has heavy aircraft experience, whereas both of the non-doctoral hires do. In short, the hit rate for heavy aircraft experience among recent outside hires is only 50% for people having or anticipating the doctorate, but 100% for individuals holding only a masters degree. Moreover, if one omits the retired airline captain as an anomalous hire unlikely to be repeated, the heavy aircraft experience rate for doctoral people drops from 50% to 33%. (The airline captain estimates that among the tens of thousands of active airline pilots in America, only about seven to ten at any one time hold a doctoral degree.)

What do these numbers mean? The fact is that aviators with heavy aircraft time who also hold a doctoral degree are in very short supply. The idea should surprise no one experienced in the world of aviation. Military and commercial pilots as a group are intelligent, highly professional, practically oriented individuals. Few are or would admit to being "intellectuals," and fewer still have any desire to write and publish scholarly articles or to undertake earning a doctoral degree. Why should they? Pilots, even those who are academicians, typically eschew abstract thought. They are as unlike Shakespeare's Hamlet—an academic of sorts whose resolve is "sicklied o'er with the pale cast of thought"—as anyone can be. What aviators need to know about their practically oriented discipline they have learned from experience in the cockpit. What the pilots who teach at Riddle need to know about classroom teaching methods, they also quickly learn on the job, with willing help from their more seasoned colleagues.

It follows from all this that collegiate aviation departments will have trouble finding doctoral faculty with heavy aircraft experience in adequate numbers to conform to the university paradigm. Certainly Embry-Riddle's Aeronautical Science program has thus far not been notably successful in this respect. The improved percentage of recent doctoral hires does suggest that the department may in the long run be able to modestly increase its percentage of faculty holding such a degree. However, doing so will

likely result in a drop in the percentage of faculty with heavy aircraft experience, unless at the same time increasingly larger percentages of individuals having this latter requisite but holding only masters degrees are also hired.

As an example of how hiring faculty with doctorates may affect department demographics, 16 of 26 current full-time teaching faculty (62%) have heavy aircraft flight time but hold only a masters degree. Assume that this ratio as well as total faculty size holds constant, but that the number of faculty with doctorates increases to 50%. Then if about one-half of the doctorates (6 out of 13) has heavy aircraft experience, the number of faculty with heavy aircraft experience drops to around 50%. If about one-third of the doctorates (4 out of 13) has heavy aircraft experience, the overall faculty percentage with heavy aircraft experience drops to about 46%. How low this percentage can go before the department suffers is debatable, but most faculty on board today would probably agree that the current rate of 62% is already severely pushing the limit. To achieve the more attractive rate of 75% heavy aircraft experience, the maximum number of doctoral faculty could be no greater than 50% (13 individuals), if one in two doctoral faculty was a heavy aircraft pilots. If only one in three had heavy experience, the number of doctoral faculty could not exceed 35% (nine individuals). Note that these figures assume *all* teaching faculty with only masters degrees will have experience in heavy airplanes.

A final demographic of interest is the number of departmental faculty tenured or eligible for tenure. Of 26 teaching faculty, 10 currently are tenured (38%); three others have some kind of *de facto* job security as a result of "grandfathering" when the up-or-out tenure policy was implemented, bringing the total of "permanent" departmental faculty to 13 (50%). Five individuals (19%) are on the tenure track on an up-or-out basis but not yet tenured. Eight faculty (31%) hold non-tenure track appointments, enabling them to continue indefinitely in their positions if needed without having to meet tenure requirements, but affording them no real long-term job protection.

All 13 of the "permanent" faculty, and all but two of the tenured faculty, received their appointments before the up-or-out policy was implemented. That is, only two full-time teachers have been tenured in the past ten years. In the same period, a third person—a highly dedicated ex-military fighter pilot with a masters degree and superb teaching and management skills—was denied tenure for insufficient publications. This individual—a top performer in the opinion of virtually everyone in the department—was hired before the shift to the university paradigm. Fortunately for the department, he remains on the faculty

today by virtue of a 12-additional-years "grandfathering" provision. The denial of this individual in 1994 led directly to the department's subsequent increased use of non-tenure track appointments.

The eight Aeronautical Science faculty on non-tenure track contracts were all hired after the department began moving to the university paradigm. None of these individuals holds a doctoral degree. During the same period, as we have seen, five full-time teaching faculty were hired on the tenure track, 80% of whom hold doctorates or are doctoral candidates. Only half of these "doctoral" people have heavy aircraft time. By contrast, seven of the eight non-tenure track faculty hired in the same period (88%) have heavy aircraft experience. From these contrasting figures, one sees that Aeronautical Science department has been using non-tenure track appointments to assure that the experienced pilots it hires with only masters degrees will not have to leave the university after a period of only six years.

In short, the department—unable to hire enough doctoral faculty with appropriate aviation experience—has for the past ten years used non-tenure track appointments to shield itself from the university paradigm while preserving some semblance of the industry paradigm which has worked so well in the past. This behavior is not defiant of higher authority, nor does it reflect a desire to avoid hiring faculty with doctorates. Rather it is simply a gesture of self-preservation. As always, departmental administrators hired the best-qualified faculty they could recruit. During this period, a number of well-qualified individuals—many incidentally did not have a doctorate—refused offers of appointments. The typical reason proffered was low remuneration coupled with high performance expectations outside the classroom, principally the requirement for a doctorate and publication in order to have a realistic chance at tenure and promotion.

As an illustration of this point, consider the circumstances of a search conducted in Spring 2002 to fill an entry-level faculty position in Aeronautical Science. Embry-Riddle administrators strongly advised hiring an individual with a doctorate. Of about 70 applicants, approximately 20 held doctoral degrees. Only one of these 20—an EdD—also had heavy jet airplane experience. When this individual declined the proffered position, the second ranked candidate, an individual medically retired from a major airline, accepted the job. No doctoral-holding candidate other than the EdD with heavy aircraft experience made the short list of top ten candidates for the position.

I am one of a number of long-serving Aeronautical Science faculty who believe the experiences of the past ten years suggest that the university paradigm will not work

Alternative Paradigms

well in our department. The problem is only partly low salaries together with a twelve-hour teaching load and substantially increased work requirements associated with conducting scholarly activities. To be sure, salaries are modest in most tuition-supported institutions, and yet faculty in traditional disciplines accept them out of a love of the academic life. However, Aeronautical Science is not a traditional discipline, and very few pilots are traditional academics. Military-trained pilots are used to real-world salaries and work loads. Many—experience has shown—will not accept an academic salary for a forty-hour per week teaching/service commitment together with an additional fifteen or twenty hours per week to perform scholarly activities. But if the university paradigm fails in Riddle's Aeronautical Science Department and in other collegiate aviation departments—and it probably will—the primary cause will not be low salaries. Rather, it will be the fact that there is no adequate source of research faculty for collegiate aviation departments. The supply of pilots with heavy aircraft experience together with a doctoral degree and an interest in scholarship is simply insufficient to staff every faculty position in such a department.

The current chair of Aeronautical Science at Daytona Beach, Rob Owen, appears to have hopes of countering this difficulty. With a PhD earned on active duty with the Air Force, Dr. Owen is a well published, recently retired bird colonel who has heavy aircraft experience flying the C-130. With such a background, he is an ideal Aeronautical Science faculty member. Ironically, Rob would not have been interested in joining our faculty except in the role of department chair. Aspiring to a higher leadership role somewhere in academe—he will almost certainly succeed in this aspiration—Rob has said from the outset of his tenure that he does not intend to remain indefinitely in his present position.

Dr. Owen has articulated a strategy to increase the number of doctoral faculty with heavy aircraft experience by recruiting faculty retirees from service colleges such as the Air Force Academy, and by supporting current faculty members who wish to pursue a doctoral degree. The former idea is interesting, but for many obvious reasons one could not build a viable department with large numbers of individuals who enter the Aeronautical Science faculty only late in life, most of them presumably in their late fifties or older.

The idea of growing our own scholars is more intriguing, but this approach nevertheless has its potential drawbacks. PhD programs are arduous and are well known to have high attrition rates, especially in the dissertation stage. Most if not all require two years of full-time residential course work. For people residing in the Daytona Beach area, undertaking such a program also requires the

expense of relocating, since there are no research universities within realistic commuting distance. As an example of the hardships inherent in such programs, in the 1990s I completed a doctoral degree in computer science at the University of Central Florida in Orlando. This program required me to be absent from the Embry-Riddle campus for three calendar years, and to live apart from my wife for two and one-half of these three years, returning home only on weekends. More important, I would not have been able to undertake such a program had I not had a personal source of income to sustain me—in addition to the partial salary the university granted me during part of that time. In addition, I could not have pursued the degree were my home not paid for, or had my children not been grown and living independently. While the university invested perhaps \$25,000 or \$30,000 in adjuncts to replace me in the classroom during my absence, I estimate my own costs to obtain the degree—tuition and books, travel and second-home living expenses, and forsaken salary—at no less than two and one-half times the larger dollar amount. Finally, though I completed course work and qualifier exams expeditiously, the dissertation took two years longer to finish than I had anticipated, negatively affecting my personal life during that entire time. Up until close to the end I remained uncertain as to whether I would complete the degree program successfully.

There are likely to be very few heavy aircraft pilots willing or able, in mid life, to make the financial and personal sacrifices required of someone studying for a doctorate. Of those who do accept the challenge, statistics suggests that not all will successfully complete the programs they undertake. And all this assumes that Embry-Riddle is willing to pay a large portion of the expenses of such an undertaking, which is probably the most dubious hope of all. In short, moving in this direction may result in only a few more doctoral faculty in the Aeronautical Science department. For those willing to tackle its significant challenge, I support the "grow-your-own" doctoral program without reservation. But such a program will almost certainly not produce a department based on the university paradigm. Moreover, though more doctoral degrees will ostensibly result in more scholars, how will the publications the scholars produce in their chosen academic fields advance the goals of the Aeronautical Science Department? After all, other than aeronautical engineering, what PhD fields support practical pilot-oriented research that is aviation-related? Human factors with an aviation-focused dissertation is one. There would seem to be few others.

THE HYBRID PARADIGM

The hybrid paradigm is simply an amalgam of the industry and university paradigms. Under the hybrid paradigm, some faculty are on the "industry track," contributing teaching and service to an undergraduate collegiate aviation department. These people often will not be involved in scholarly activities, and they need not have a doctoral degree. Other faculty are on the "university track," hold doctoral degrees, and must contribute scholarship in addition to teaching and service, or in some cases in addition just to teaching. This paradigm is the one that has evolved in the Aeronautical Science Department at Daytona Beach since the implementation of the up-or-out tenure policy. Recently hired faculty on the university track have appointments leading to tenure or non-renewal after six years. They must publish to remain in the department. Those on the industry track currently have so-called non-tenure track contracts, and can remain on the faculty indefinitely subject to the needs of the department and the university. This bipartite division, we have seen, has come about quite naturally because university track job candidates with appropriate aviation experience have not responded in sufficient numbers to widely disseminated announcements of available faculty positions. There is an inescapable irony inherent in such a division: some recently hired faculty who don't publish—those on the industry track—can keep their jobs indefinitely; others—those on the university track—can't. This situation has created lingering distain in the Aeronautical Science faculty for high-level Riddle administrators who conceived the hiring/promotion/tenure policy leading to it.

I believe collegiate aviation programs in general—and Embry-Riddle's Aeronautical Science programs in particular—should be structured on the hybrid paradigm. Such an organization best accommodates the needs of the department, the university's desire for more faculty research, and the supply of qualified available faculty. The industry paradigm is the basis of the best flight training departments in the world. The Aeronautical Science Department should be able to continue its proven successful approach based on this paradigm, i.e., should be free to hire, retain, and promote the kind of faculty members that have brought it to its present position of preeminence in the aviation world. Under the hybrid paradigm, individuals with heavy aircraft experience would be hired on industry track contracts if their degree credentials and/or personal interests proscribe research and publication. The principle responsibility of such faculty would be teaching undergraduates and providing service to the department.

However, the department also needs research faculty with doctoral degrees. Aeronautical Science should

feel an obligation—I think—to conduct aviation research. In the thirty plus years since it became a university, the department and institution have matured sufficiently to make this additional goal both plausible and desirable. Success in research will improve practices in the world of aviation, increase the university's prestige and influence in the aviation industry, and benefit the university financially. The department should therefore assemble a corps of university paradigm doctoral faculty focused on conducting research in the field of aviation. The principle responsibility of these individuals would be teaching and research, with an emphasis on the latter in some cases. Movement in this direction, one should add, is already evident in the department. As previously mentioned, one current faculty member has an endowed chair appointment allowing him to concentrate pretty much exclusively on non-teaching activities.

The dual-track approach to teaching and research would replace the department's current research effort, which is not viable. The present approach is simply to mandate publication as an additional faculty responsibility while still requiring teaching and service loads characteristic not of research universities but of undergraduate colleges. This approach is naïve. Faculty expected to produce quality research which advances departmental goals must be granted reduced teaching loads and lower service expectations. Then too, research goals must be more focused than they have been in the past. Academic administrators currently view almost anything a faculty member publishes as "scholarship." The subject need not even be aviation related. One wonders how many typical "check the box for promotion and tenure" publications actually benefit the department or university. How much of this work actually advances knowledge in aviation or makes the author a better teacher? Some of it, without doubt, but surely not all, and perhaps not even most. Certainly little of it brings money into the university, or leads in that direction. Yet it has been clear for ten years that when Embry-Riddle academic leaders say they want faculty to *conduct more research*, they actually mean *obtain more research funding*. It is very hard to dismiss such a request out of hand. Can Embry-Riddle—or any university—remain a world-class institution while relying only on funding from tuition?

Certainly the Aeronautical Science Department should do nothing to discourage research and publication in aviation-related areas unlikely to result ultimately in external funding. Producing money is not the goal of all meaningful scholarship. Nevertheless, the ability to bring money into the university is highly desirable in a faculty member, and money is available in most technical areas, aviation included. Perhaps the department might consider

Alternative Paradigms

hiring or grooming from within a few well-paid aviation researchers who teach only one or two courses per semester, and whose primary goal would be generating funded research the value of which exceeds their dollar cost to the university. These individuals would be judged in significant part by their success in producing research funding, and according to their ability to involve colleagues with higher teaching loads as co-researchers, and to mentor these co-researchers.

By creating such a cadre of researchers, the department would acknowledge the realities of obtaining and conducting funded research. Success in this area depends upon gradually building a personal bibliography of relevant scholarly works. Then too, as few as one out of four submitted research proposals is actually funded. Thus, failure usually precedes success in obtaining initial research grants which make getting subsequent, more lucrative grants easier. All this activity is extremely time-consuming. Finally, actually conducting funded research and reporting on it also takes a lot of time. Everyone who has studied or worked at a research university knows that many published papers emanating from funded research are byproducts of graduate students' doctoral dissertations or course research papers. Others are written by post-doctoral research fellows with new PhDs who initially are willing to work for relatively low salaries in order to benefit ultimately from the prestige of having been a research fellow. The situation at Embry-Riddle is complicated by the fact that there are few graduate students and no doctoral candidates in the College of Aviation to lend low-priced research assistance.

HYBRID PARADIGM CHALLENGES

Structuring collegiate aviation programs on the hybrid paradigm is desirable for two reasons. First, it allows hiring dedicated undergraduate teachers who have the requisite heavy aircraft experience but little or no interest in engaging in scholarly activity. These are the type of individuals who have made the Embry-Riddle Aeronautical Science department, for example, what it is today, and who are needed to ensure its continued success in the future. Second, structuring on the hybrid paradigm allows an aviation department to pursue an approach to scholarship/research that has the potential to benefit—in addition to researchers themselves—both the aviation industry and the university. Nevertheless, adoption of the hybrid paradigm will present some significant challenges to departmental and university leaders.

First of all, scholars are drawn to university environments where they encounter strong peer support and are able to interact with successful colleagues of like minds. Creating such a synergistic environment in a collegiate

aviation department is not an easy undertaking. Department chairs and deans alone cannot accomplish it. They will need the help of resident scholars themselves, who must identify desirable colleagues and find ways to entice them to join the university's scholarly community. At Embry-Riddle, for example, little has been done to build such a community. Yet a sustained effort in this direction might prove successful. After all, Embry-Riddle enjoys a reputation as the foremost aviation university in the world, and Daytona Beach is a pleasant, moderately priced place to live. Then there is at hand the world's most famous beach on which to wile away the few leisure hours a researcher's life affords him. These are powerful motivators for attracting established aviation scholars to our department.

Another challenge the hybrid paradigm presents is that change in this direction will to some extent increase the average workload of teaching faculty. Faculty hired as researchers will require reduced teaching and service loads. This does not imply however that they will not work hard. In most universities—as in industry—successful researchers in technical areas work seventy or more hours a week (and are well compensated for it.) But if research faculty on the university track teach less than the current four courses per term, and if their service responsibilities are also reduced, then obviously teaching and service loads for industry track faculty must increase, unless of course the university agrees to increase the departmental budget for faculty salaries, an unlikely eventuality. However, good hiring practices can—I think—deal with this potential difficulty. The department chair, advised by senior professors, can devise suitable tradeoffs in teaching, service, and research loads, as well as an appropriate balance in the ratio of industry track to university track faculty. One inexpensive alternative that immediately comes to mind is having willing industry track faculty teach course overloads to subsidize reduced teaching for researchers. As an example, teaching overloads—we have seen—is already a common practice in the Embry-Riddle Aeronautical Science Department. Another is to write some industry-track faculty contracts to require a 15 semester hour teaching load in exchange for minimal service expectations. Finally, low cost administrative assistants could be hired to undertake a major portion of routine but very time-consuming faculty activities such as student advisement and registration.

In short, under the hybrid paradigm, everyone in a collegiate aviation department will have to work a little harder, because a new dimension—research—has been added to the workload mix without increasing departmental funding. The payoff for this increased responsibility will be a better department and enhanced faculty pride. This

challenge seems addressable, at least at Embry-Riddle. I know my Aeronautical Science colleagues to be hard-working professionals with an unselfish dedication to our university and its students. Most of them stay at Riddle as much for love of their job as for the money they earn. Such individuals will accept a little more work to the end of creating an even better department and university, assuming they are accorded the respect their efforts deserve.

A third difficulty in implementing the hybrid paradigm is that it conceivably could lead to faculty elitism. University paradigm faculty may be perceived as superior to industry paradigm faculty both within and outside the department. Elitism of course is a problem in many universities. As far as difficulties within Riddle's Aeronautical Science Department, I believe they will be minimal or non-existent. The hybrid paradigm is already an unacknowledged reality, and is working smoothly inside the department. Most faculty if not all accept the fact that some individuals wish to focus on teaching and scholarship, while others prefer the teaching and service blend. The situation outside the department is different. Industry paradigm faculty—currently called non-tenure track faculty—perceive that the Riddle administration views them as second-class citizens and is reluctant to promote them. This perception is certainly not without basis: recent promotion decisions recommended by the department faculty have been uniformly rejected by the administration. But I think good departmental leadership can reverse this situation. And it certainly must be reversed before a department structured on the hybrid paradigm can prosper.

In a department structured on the hybrid paradigm, industry track faculty and university track faculty must be equal citizens in all respects. Appointments in both areas should be tenure track. Hard-working and productive faculty in both categories should have equal opportunities for tenure and promotion. After all, both categories of faculty are required for the continued well being of the department. In general, salaries in both categories should be comparable. The sole exception to this idea might be better remuneration for faculty members whose funded research subsidizes a significant portion of their salaries. And of course, the best people in the department will make the most money, as has always been the case. A corollary to this idea is that low performers, regardless of whether they are judged under the industry paradigm or the university paradigm, will not be tenured and/or promoted.

The last difficulty with the hybrid paradigm follows directly from the previous one. University faculty from traditional academic disciplines are hesitant to

recognize the special needs of collegiate aviation departments. At Embry-Riddle this difficulty is reflected in the existence of an uninformed impression among some faculty that the Aeronautical Science Department is able but unwilling to conform to the university paradigm. My own service in Aeronautical Science was interrupted by a fourteen-year interim period as a faculty member in the Computer Science Department. As Computer Science's representative on the Daytona Beach Campus Tenure Committee in the middle 1990s, I had an opportunity to observe first hand what I can only view as biased attitudes about Aeronautical Science faculty. These prejudicial attitudes led to one decision to deny tenure that in my opinion was especially egregious. During meetings where that decision was taken, I was unable to explain convincingly to my colleagues on the Tenure Committee why Aeronautical Science is different from traditional academic disciplines—and why Aeronautical Science faculty should therefore be judged by criteria different from those used to judge traditional faculty. That long-ago failure was in fact a motivator in my decision to codify my thoughts on the subject, and to write them down in this paper.

CONCLUDING REMARKS

In my view, Aeronautical Science is a non-traditional academic discipline. No university in the world produces PhDs who can be recruited as entry-level faculty for this discipline. The kind of faculty member collegiate aviation departments need in significant numbers—a well-trained heavy aircraft pilot with verbal skills and an interest in teaching academic subjects to student pilots—is typically uninterested in writing scholarly articles. It is in the best interest of universities with collegiate aviation programs to acknowledge these realities and to capitalize on them.

Aeronautical Science at Embry-Riddle vividly illustrates this claim. The department is by far the university's biggest department and primary tuition-generator. Moreover, students who leave the Aeronautical Science program for various reasons but who remain at the university constitute a significant number of the graduates in other academic fields. Enrollment declines experienced in Aeronautical Science would produce a very noticeable ripple effect throughout the university. Implementing the hybrid paradigm—perhaps I should say legitimizing it, since it already exists in a *de facto* form—is thus required to assure the continued well-being of not only the department but also the university. Aeronautical Science is one of only two flagship programs at the university, the other being Aerospace Engineering. Together these two departments hold almost three-quarters of all students on the Daytona Beach Campus. Aeronautical Science is much

Alternative Paradigms

the larger of the two—currently not quite twice as large. Both programs must be healthy for the university to be healthy. If Embry-Riddle wishes to shoot itself in the foot, it can take aim at any one of the remaining half-dozen or so smaller academic departments. A bullet hitting Aeronautical Science penetrates straight to the university's heart.

Formally acknowledging the shift to the hybrid paradigm in Aeronautical Science at Embry-Riddle will require amending the University's Faculty Handbook, which currently mandates superior performance in all three academic areas—teaching, service, and scholarship—for tenure and promotion. Under the hybrid paradigm, Aeronautical Science faculty would be judged on their performance in a minimum of two of these three areas, i.e., on teaching and service for most industry track faculty, and alternately on teaching and scholarship—and in some cases service—for university track faculty. Recent statements by the Chancellor of the Daytona Beach Campus indicate that he would not be disinclined to support this “two-out-of-three” approach to faculty evaluation. Consequently,

Aeronautical Science leaders may well be able to convince Riddle administrators that a department structured on the hybrid paradigm will best ensure the continued success of the Aeronautical Science program. Efforts to explain Aeronautical Science and its special needs to other academic departments can also succeed, especially since without a healthy Aeronautical Science program, enrollment in these departments could decline, with an ensuing loss of faculty jobs. I hope such a public relations effort begins soon. Should it fail to succeed, the outlook in the long term for Embry-Riddle Aeronautical University may be less than entirely favorable.

I would be remiss if I did not mention in closing that at least one other Embry-Riddle College of Aviation discipline falls in the same “non-traditional” category as Aeronautical Science. That discipline is Air Traffic Control, a recently implemented major where a faculty member must have significant on-the-job experience in order to be employable. Most of the observations I have made about Aeronautical Science at Embry-Riddle apply as well to Air Traffic Control. →

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