

Benchmarking Aviation Safety Professionals through Certification

by
Roger L. Brauer, Ph.D., P.E.
Certification Consultant
and
Curt Lewis, P.E., CSP, FRAeS, FISASI, ATP
President
Curt Lewis & Associates, LLC

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Abstract

At present, there is no certification program for individuals dedicated to ensuring aviation safety in general or for professionals engaged in aircraft accident prevention, analysis and investigation. The purpose of this presentation is to discuss the need for a certification program, to outline what it takes to create a certification and to summarize a path leading to the establishment of a program of certification for aviation safety practitioners. The presenters will outline what is necessary to establish a quality program that can achieve international accreditation. Presenters will discuss cost, resources and a timetable to develop and implement a certification program. They will identify barriers to success and suggest ways to hurdle those barriers.

Introduction

How can someone demonstrate knowledge and competency in a domain of practice? When hiring, most employers look for education and experience. They conduct interviews to determine whether someone is likely to have a good fit with their organization.

Some professionals must have a license to practice at all. In most cases, licenses are issued by states. In aviation, pilots obtain a license from the federal government. Governments have the responsibility to protect the health, safety and welfare of the public. Normally, licensing addresses those domains of practice that offer services directly to the public. There are many other domains of practice that do not offer services directly to the public but offer services to employers. The employers have liability for their products and services.

Unlike licensing, certification is a voluntary system and offers a way to assess minimum competency for a domain of practice. Certification is usually run by peers in a domain of practice. Certification does not limit practice, since someone can practice in a domain who does

not hold certification. Certification becomes a benchmark for practitioners who wish to have an independent evaluation of their qualifications, knowledge and skills.

Both licensing and certification follow similar methods to assess competency. Most have minimum education or training requirements. Most have an experience requirement. Typically, both require someone to pass an examination covering the elements of practice. Today, there are also standards to assure that practitioners stay current through continuing education and/or re-examination.

The concept of certification is simple. You set standards for practice. You evaluate people against the standards. You award certification to those who meet and continue to meet the standards.

What seems simple, gets very complicated. That is especially true when the process must be legally defensible and financially sound. We will explore some of the details.

The Need

Why is certification needed for a domain of practice? One reason for establishing a certification is to help employers find competent practitioners. Another reason is to elevate the quality of the domain of practice. Additionally, practitioners want a way to define what actually constitutes practice.

In order to have a clearly defined domain of practice, there must be a pool of practitioners doing the same functions and tasks. Certification cannot assess competency for individual job positions. Certification focuses on the elements of practice that are common across many positions. There must be enough commonly held functions and tasks to characterize a domain of practice that applies to many job positions.

Benefits of Certification

Certification offers benefits for many different groups, such as practitioners themselves, the domain of practice, employers, industries, government and the public.

Practitioners

Practitioners benefit by having met standards of practice established by peers. They gain recognition among peers for having sought and met the certification challenge. They have demonstrated their competency and are recognized professionally for it. A commonly reported benefit by new certificants is “the process made me learn the practice.” They had to prepare for all of the knowledge and skills covered, not just those they already knew.

Domain of Practice

The domain of practice benefits because there are clearly defined standards of competence for those who claim to be practitioners. Individuals can demonstrate compliance with those standards to expand the credibility of the practice overall.

A certification process levels the playing field. A certification process does not differentiate those who learned the practice through experience from those who learned it through academic study. Regardless of how people got into the domain of practice, the process to demonstrate competency is the same for all.

Employers

Employers benefit by hiring individuals who have gone through a competency assessment. The standards may have involved education/training, experience, knowledge by examination and ongoing professional development. Knowing that someone has met certification standards adds to other information gleaned during a hiring process.

Employers are also likely to benefit from the performance of certified individuals. They are able to apply the knowledge and skills of the domain of practice. In general, there are fewer gaps in experience and knowledge for certified people than for non-certified people. Employers have some assurance that individuals have the background to make aviation safety recommendations.

Industry

An industry that relies on a domain of practice also benefits. For example, the aviation industry could benefit through elevated standards and practices for aviation safety practitioners and those specializing in aviation accident prevention, analysis and investigation. The industry gains credibility from minimum standards for practitioners.

Public

Ultimately, the public gains from certification, even when a domain of practice does not offer its services directly to individuals in the public. The public has assurance that a domain of practice and those working in the domain offer competent services and offer knowledgeable information and recommendations.

Elements of a Successful Certification Program

A certification requires many elements to be successful and legally defensible.

Fairness and Independence

As noted earlier, qualifications for certification usually involve education or training, experience,

examinations and continued learning. Each certification sets specific qualifications. In setting such qualifications, a certification organization must ensure non-discrimination. It must ensure fairness to all applicants and candidates. One candidate cannot be given preference or an advantage over any other candidate. All must be treated alike.

A certification organization must be independent and free of undue influence from other organizations. It must be able to independently determine which individuals have meet the standards required for certification.

A certification organization must not prepare people for certification through training and education. Doing so creates a conflict of interest. Should someone who completes a preparation course or program fail to pass the examination, there is an immediate opportunity for a legal challenge.

Examinations

An examination must meet accepted standards for validity and reliability. Also, it must be secure. Development must follow recognized practices. Failure to achieve recognized examination standards opens the door for legal challenges. Improperly developed examinations or loss of an examination or part of one can put a certification organization out of business.

Validity. Validity means that an examination covers that which is relevant to the domain of practice. The examination measures what it is suppose to measure. Some call validity procedures job analysis or role delineation. Recognized validity procedures involve panels of subject matter experts and practitioners who define the functions and tasks of practice and the knowledge and skills necessary to perform the tasks. It is an expensive procedure to develop the content outline or blueprint for a certification examination.

Normally, test and measurement experts (psychometricians) lead the validity process. Typically, panelists rate final knowledge and skills statements of practice on multiple scales, such as relevance for my practice, importance for my practice, and failure to protect the public should someone not have knowledge covered by the content of a statement. Statistical analysis defines the final examination blueprint and what portion of the examination is devoted to each major knowledge/skill area.

Reliability. Reliability means that an examination will generate the same result even if someone takes the examination a second time. There are psychometric procedures and statistics for assessing reliability. If there are several editions of an examination, reliability ensures that each edition will produce the same result for the same examinee.

If there are multiple forms of an examination or forms in multiple languages, reliability means that all forms produce the same result for an examinee.

Items. After creating the valid examination blueprint, there is a need to develop examination items (questions) to test knowledge or skill for each blueprint statement. That is also a difficult

and expensive task. Draft items go through a series of steps to achieve quality. Draft items much pass technical, psychometric and readability edits. All items must have published references to support the correct answer. In many cases, items are evaluated for performance on an actual examination while not counting them toward the passing score. Only items that perform well based on specific psychometric statistics should be used on an examination.

In the United States, psychometric practices usually rely on multiple choice formats for items. There are many standards for quality multiple choice items.

For some skills, there may be a need to use other types of examinations beside written items.

Passing Scores. Setting passing scores also involves complex psychometric procedures to assure defensible examinations. A certification examination must offer every candidate a fair chance of passing. The scores of other candidates cannot a candidate's ability to pass. As a result, scoring methods commonly used in schools are not acceptable for certification examinations. Passing scores cannot be set arbitrarily, such as 60 percent or 70 percent.

Many certifications use a procedure called the Modified Angoff Method to set an examination passing score. In this procedure a panel of subject matter experts rate the difficulty of each examination item in terms of what portion of minimally qualified candidates will know the correct answer.

Examination Delivery. In most cases today, certification organizations contract for examination delivery with companies that operate testing centers throughout the United States and in other countries. If the volume of examinations delivered is sufficient, use of computer-delivered examinations is preferred over paper-and-pencil examinations. These companies essentially rent seat time at testing center workstations while providing controlled environments with high levels of security.

Security. In all aspects of examination development, maintenance and delivery, security is critical. Even a limited breach of security renders an edition of an examination unuseable. The replacement cost is on the order of \$2,000 to \$3,000 per item. For a one hundred item examination, the loss for a certification organization can be very high. In addition, there is loss of program credibility.

Governance

Most certification organizations are 501(c)(6) organizations. They are not charitable organizations, but qualify for a waiver of income tax.

Governance bodies typically have 7 to 15 representatives overseeing the organization and its business. Bylaws set the terms of office. Limited periods of service are preferred to achieve a mix of expertise over time. Most representatives are practitioners with a variety of geographic and other demographic characteristics. Because the public is the ultimate stakeholder, it is customary to have one person on the governance body who is not from the domain of practice or involved with it and represents public interests in general.

The primary role of the governance body is to set direction, establish policies and procedures, and oversee the financial condition. These are primarily legislative roles. For a newly established certification or an organization with a small number of certificants, members of the governing body may also serve as subject matter experts for examination development and provide volunteer time to handle administrative tasks.

A governance body also has judicial roles. A committee may handle those proceedings. Officers award certification. They may also remove or invalidate certification if fees are not paid or if there is a violation of ethical or other standards. There must be hearings for potential removal of certifications.

Also, there must be final rulings on appeals of standards and qualifications. Certification procedures must incorporate “due process” concepts that allow people to appeal decisions.

Administration

Administration involves the day-to-day operation of the certification organization. It must be staffed with leadership for the certification organization and people knowledgeable in certification practices, customer service, program rules and procedures, budgeting and finance, management systems, records management, privacy and confidentiality, marketing and sales, contracting, teamwork and other administrative details.

Selection and training of staff are critical to success. Certification is a very complex business if an organization is to operate with excellence. All employees should go through a comprehensive training program that covers all aspects of certification. That ensures that they know how their roles contribute to the overall enterprise. In addition, all employees must learn how to perform the details of their positions and how to handle the special cases and appeals that arise.

Collaboration within the staff is essential in a certification operation. No one person can know all of the answers to issues that come up with individual customers or for the organization. Collaboration between staff and the governance body is also critical.

Legal Support

There are many legal considerations for certifications. Obviously, legal assistance is important when formulating a charter and bylaws.

General legal counsel is necessary to support normal business matters, such as contracting, copyrights, review of policies and procedures, legal review of governance proceedings, guidance and coordination of judicial matters of the governing body, handling of legal requests for records of the organization or individuals seeking or holding certification, and any legal challenges faced by the organization. Examples of judicial matters are violations of codes of ethics or other standards involving discipline, violations of fiduciary responsibilities, conflicts of interest, appeals of denial of eligibility or invalidation or revocation of certifications, unauthorized use of certifications or logos, and other compliance matters applicable to candidates or certificants.

Engagement of specialized legal services, especially for protection of intellectual property, is valuable also. Examples are filing for certification and service marks, protection of names and logos, challenges to organizations and individuals that potentially infringe on the intellectual property of the certification organization.

When contracting for psychometric services, it is a good practice to include a contract paragraph stating that the psychometric service will provide legal defense for psychometric challenges as long as the certification body follows the psychometric advice of the contracted firm.

Marketing and Sales

A certification organization sells use of its certification name and/or acronym. To be successful, the organization must market its certification product(s). Individuals who potentially meet a certification's qualifications need to learn about the certification and its benefits. The organization closes a sale when someone files an application and pays the application fee. The ultimate goal is to get new applicants through the certification process in a timely manner and award the certification.

Those individuals who achieve the certification typically pay an annual fee to use the certification title and acronym. That also requires marketing in order to extend the period during which someone holds a certification. A certification organization must identify the ongoing benefits of the certification during the period of certification for individuals, employers, government organizations and industry organizations. Such marketing also promotes the flow of new applicants.

Direct customers are potential applicants, candidates who have applied, and those who achieved certification. Indirect customers are employers, users of certified practitioners and the public, who influence individuals to achieve and retain a certification.

The marketing strategy for each customer group may differ. The information they need will vary.

A very important part of marketing a certification is selling professionalism, not just the certification product. Professionalism addresses the growth for individuals in the domain of practice and the value they bring to employers and other users of practitioners. Most stakeholders endorse the value of continuing to improve in practice through certification and continual professional development.

Marketing of a certification must recognize that certification is not an impulse buy. It is not like the impulse item display at the Walmart checkout counter. People do not pursue certification on a whim. People devote a lot of time and cost in preparing for and achieving certification. Certification requires an ongoing investment through fees and continuing education. A certification organization must conduct research to demonstrate the return on investment and the value its credential(s) offers.

Financial Success

For a certification organization there are two major financial considerations. The first is having enough money to get the program established. The second is achieving an ongoing revenue stream to exist and to build reserves that can be invested to make the organization and its services better.

Start Up Funds. Start up funds must cover creating and operating initial governance. They must cover a job analysis study, item development, examination composition and arrangements for examination delivery. Start up funds must cover development of marketing materials and a marketing plan. They must cover initial staffing and creation of qualifying standards, candidate procedures, and a range of operating procedures. Funds must handle development of record keeping, record management procedures and business systems (web site, social media, phones, copy machines, databases, etc.), facilities and furniture.

The cost to start a certification and a certification organization that supports it is likely to fall in the range of \$500,000 to achieve quality. A later section of this paper provides more details.

Operational Funds. Once a certification is in operation, it must be able to sustain itself. The application, examination, annual renewal and any other fees must pay all costs of facilities, staff, benefits, contractors, and overheads and build reserves. Certification must cover all costs for an organization to remain viable. Certification cannot be a loss leader item and stay in business.

While a certification organization is usually a not-for-profit organization, it cannot exist if it loses money. Pricing for all fees must cover their costs. There should be a plan for net revenue (profit) built into all pricing. Regularly scheduled adjustments in fees are essential to prevent inflation from consuming net revenue.

It is important to begin building reserves from the beginning. Reserves will pay for required future projects and for efforts to improve the organization and its certification. Reserves also provide flexibility should there be an interruption in business.

Other Considerations

Some other more subtle factors help assure success for a certification. For both governance and staff units, it is important to build a culture of excellence. There must be a focus on customer service that encourages applicants, candidates and certifications to value the certification. There must be analysis to identify what works well and what needs improvement. There must be an eye on the marketplace with input from stakeholders to foster agility, which prevents other certifications from filling gaps and capitalizing on poor performance. There must be research to document the value that the certification brings to stakeholders as a way to encourage greater participation.

Accreditation

A medium range goal is achieving accreditation for the certification. Being able to show employers, users of certificants, government agencies and the public that a certification meets independently established third-party standards increases the value of a certification. Accreditation can be a goal from the beginning, but pursuing accreditation is not possible until a certification is fully in place and people have achieved the certification. The key at the start is creating a certification and the supporting organization with an eye on accrediting standards so that a certification can eventually become accredited. It is easier to have the accreditation standards in mind at the beginning than to make changes later to achieve accreditation.

Within the United States, there organizations that set standards for certifications and evaluate the certifications against the standards. A primary accrediting organization is the National Commission for Certifying Agencies (NCCA). It operates as an arm of an association devoted to the business of certification, the Institute for Credentialing Excellence (ICE). The web address for NCCA and its standards is <http://www.credentialingexcellence.org/ncca>.

Because aviation safety in an international enterprise, any certification for aviation safety should also focused on international accreditation standards for certifications. The American National Standards Institute has responsibility for implementation of the international standard in the United States. The standard is ISO/IEC/ANSI 17024, *Certification of Persons*. ANSI sells the standard. The standard is found at:

<http://webstore.ansi.org/FindStandards.aspx?SearchString=17024&SearchOption=0&PageNum=0&SearchTermsArray=ansi|17024|null>

On the ANSI web site one will find a 2003 edition which has been in place for some time, a 2012 edition which is an update to the 2003 edition, and variations for certain countries or world regions.

Both organizations charge fees to certification organizations seeking accreditation of their programs. NCCA does not involve site visits by the evaluators, while 17024 does. Compliance with 17024 is more complex and considerably more expensive than compliance with the NCCA standards.

Costs and Schedule

Start Up Costs

Below is a general outline of significant start up tasks and costs. Costs shown are general estimates and will be different for an actual program.

Establish corporation, charter, bylaws and governance operating procedures	\$20,000
Establish governance; meetings to set initial certification qualifications standards and procedures; contract for psychometric services	\$80,000
Conduct initial job analysis study	\$100,000

Draft and edit items with subject matter experts	\$60,000
Develop marketing plan and create/publish marketing/candidate materials	\$50,000
Develop computer capabilities (web site, social media sites, customer management system, etc.)	\$60,000
Hire initial staff; salary and benefits for two years	\$150,000
Office space, furnishings and equipment for two years	\$30,000
TOTAL	\$550,000

A remaining start up activity is setting standards and procedures for recertification. Some organizations rely on continuing education. Some require continuing work experience. A few require re-examination. A certification organization will have to plan for implementation well in advance to consider what support systems are needed, whether recertification standards will impact the number of current certificants and what financial considerations may be involved.

Operating Costs

The primary source of revenue for a certification organization is annual renewal fees. An annual renewal fee authorizes someone achieving certification to use the certification title and acronym for one year.

Other significant sources of revenue are application fees and examination fees. Typically, the rate of applicants is much lower than the number of current certificants. Thus, application and examination fees contribute a much lower portion of the annual operating budget compared to annual renewal fees.

The rate of applicants and candidates will determine how quickly there is a group of certificants. One approach to get from start up to operating mode quickly is to find a way to get people certified quickly at the beginning. At start up some organization establish a separate set of qualification heavily dependent on experience in the domain of practice to award certification. This approach usually waives the examination requirement based on the philosophy that significant work experience is substantially equivalent to passing an examination in the domain of practice.

From the beginning it is essential to create an operating budget and to track costs, pricing, rates of applications and examinations and the number of certificants to ensure that the organization remains financially viable.

As noted earlier, it is important to build in net revenue into all fees in order to begin developing reserves that allow for improvements to the certification.

Development Schedule

A reasonable period for creation of a certification is about two years. It requires intense work to achieve all of the start up activities within that period and a lot of volunteer time especially from

the initial members of the governance body.

The start up cost table above lists the major activities that must be completed prior to launch. A new organization should develop a work plan as early as possible and assign leadership and resources to specific tasks.

The initial governance group may need to develop volunteer committees from among members of the governance group and other practitioners to assist with development tasks. Of particular importance is support for the job analysis study, crafting of draft examination items, and formulating marketing materials, operating procedures and systems. Support staff may initially involve contracted personnel.

Barriers to Success and Overcoming Them

Potential Certificant Population

In order for a certification to be viable, there must be a large enough pool of practitioners who can achieve certification. If the pool is too small, the fees to operate a viable certification become prohibitive.

In addition, it will take time to accomplish a significant market penetration among practitioners. Even if there is a large pool of practitioners, it takes time to build the number of certificants high enough to achieve financial success.

The authors understand that there may be less than 1,500 people who participate in ISASI and meet membership qualifications. The likelihood of sustaining a certification for 1,500 people is quite low, even if the certification is operated almost totally by volunteers. There are certain costs of doing business that cannot be overcome with volunteer time.

Consider some numbers. If the annual cost to operate a certification is \$600,000 and if there is a 10% market penetration (150 certificants), the average annual cost per certificant is nearly \$4000. If there is a 50% market penetration (750 certificants), the average annual cost per certificant is \$800. The cost per person is high, and most people will be reluctant to pay such high rates to achieve and retain certification.

Early in this paper the authors made an inference that there might be two tiers of certification in aviation safety. One tier would cover general aviation safety practice. A second tier would cover specialized practice related to prevention, analysis and investigation of aviation accidents. The initial tier may have 4,000-5,000 practitioners, while the latter tier would have no more than 1,500.

The larger pool improves the likelihood of a viable certification program. However, certain costs arise from each examination that is in place. Expenses for the organization are higher for two certifications and examinations than for only one. There are some strategies for a two-tier

certification that avoid creating and maintaining a second examination. Qualifications for the second tier might be based on specialized experience, similar to the ISASI membership qualification.

Gaining Program Acceptance

With any new certification, there will be some who support it and will pursue it. There will be some who will wait and see if it is worthwhile before pursuing it. There will also be those who will not pursue it and even voice opinions against it. Even if a certification goes into place, there will be some who want an easier route to certification, a form of counter culture.

A potential barrier for a new certification is convincing people to pursue it. For a variety of reasons, individuals in the domain of practice may see value in certification.

Some who have been active in the domain of practice for many years will feel that a certification doesn't do anything for them. They have the knowledge and experience already on their resume. They don't need a benchmark to denote that. Some simply will not want to pay the fees. Some will not want to sit for an examination or are afraid of being examined about their practice.

There will be a few who see certification as a mountain to climb because it is there. They will pursue it.

Studies of reasons why people pursue certification give some insight into why people pursue it. The majority of people will pursue certification because their employer makes it a professional goal or a peer or supervisor will say that it is important. This information offers marketing strategies when implementing a certification. It is critical to get employers and users of practitioners to endorse and promote the certification.

Another way to overcome the start up inertia for a new certification is to find a way to recognize those who have long experience and waive the examination as a start up incentive. However, it is best to limit the time during which people can use this path to certification.

Financial Viability

It is essential to have the start up capital to get a certification fully off the ground. Some new certifications have some funds and get partially underway before running out of money to construct a proper examination, do the necessary marketing or set up a suitable administration.

Make sure there is enough start up money to get a certification fully operational before moving ahead.

Volunteers

It is essential to find volunteers for start up who are willing to commit some time to the endeavor. There is a need for leaders to handle the initial governance tasks. There is a need for subject matter experts to complete job analysis and construct the initial examination under the

guidance of test and measurement experts. There will be a need to get others involved, too.

While drawing on volunteer services during start up it is important to avoid making such service one of the criteria for achieving certification. It is also important to guard the security of the examination as it unfolds from draft items to a complete examination.

Value for Customers

As noted above, there will be many practitioners who do not see any real value for a certification program. They may simply remain silent and not participate or they may speak against it.

Both during start up and after a certification has been in place, a critical activity for its leaders is to find ways to explain and demonstrate the value that it brings to all stakeholders. There may be a need for analysis of practice to demonstrate value to employers and users of practitioners. There may be a need as early as feasible to assess the salary benefit of certification and showing that those holding certification receive higher pay. That creates an incentive for practitioners to pursue it. The leaders may be able to gain endorsements from major employers. The governance body must be creative to find ways to demonstrate its certification's value to practitioners, employers, other users of practitioners, the associated industries, government agencies, and the public.

International Implementation

A potential barrier involves international factors for a global industry such as aviation. Several factors may affect a certification.

An important international factor is language. Offering a certification examination in multiple languages is difficult and expensive. The methods for converting an English examination into one or more other languages require a series of complex steps and performance evaluations. One simply cannot create a translated version. Among other things the examination must be translated back to English without creating significant differences with the original version.

Another factor is offering publications and literature on the certification in multiple languages. That increases marketing costs.

There may be barriers to certification in other countries involving cost, acceptance, value, access to testing centers and other factors.

Startup Recommendations

Here are a few recommendations for creating an aviation safety certification(s).

Define the Need.

Do surveys and studies to ensure that stakeholders see the importance of the certification. Be sure the responses are genuine, since it is not uncommon for people to respond positively on a survey but not behave as reported when the actual certification is implemented. Address the potential need with practitioners, employers, industry organizations and government agencies.

Ensure Adequate Start Up Funds.

Find sources of funding to cover costs of start up before beginning. There is nothing worse than taking initiating steps and then having insufficient capital to fully create and implement the program.

Study the Pool of Candidates.

Analyze the domain of practice to project the potential pool of candidates. Use conservative estimates of participation during early years when computing the financial feasibility.

Consider a Tiered Approach.

Identify how people get involved in aviation safety. Look at their professional progress and estimate how one moves from general aviation safety practice to gain specialization in prevention, analysis and investigation of accidents. Identify whether other specialties exist. Initially focus on the broad range of practice and qualifications for it. Then look at specialization and what methods and qualifications would best lead to identification of specialists. Consider whether there is an actual need for a specialty examination, since creating and maintaining an examination for a domain of practice is very expensive.

Identify the Value.

Before launching actions to construct a certification, identify the value(s) that it would bring to each type of stakeholder. Discuss whether there is sufficient value for each group to be able to sell the certification.

Organize for Development and Implementation

If there is sufficient need, if there is adequate start up capital, if there is a sufficient pool of candidates, if there is a logical certification model, and if there is sufficient value for stakeholders, then develop a detailed development and implementation plan. Identify where volunteers are needed among start up tasks. Create policy and procedures. Hire initial staff and obtain key contractors. Set an implementation schedule covering the entire start up plan. Create a budget and funding for each task in the plan.

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