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Aviating with Multiple Intelligence

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ABSTRACT

Alongside the rapid development of AI technology, which is stepping in to do tasks more quickly and less prone to error than humans can, the possibility for MI (multiple intelligence) development warrants equal attention and fervor. Recent theories of human intelligence point beyond standard cognitive capacity, IQ, and shine a light on the other unique potentials naturally endowed to humans. The applicability of MI to aviation is discussed, suggesting that it is important to consider ways to integrate MI development techniques into pilot education and training. Experiential starting points are discussed.

Key Words : MI(Multiple Intelligence), AI(Artificial Intelligence), EI(Emotional Intelligence), SI(Spiritual Intelligence), Pilot Profile

I. INTRODUCTION

The world is racing to welcome AI (artificial intelligence) into all areas of modern life, and the aviation field is one of the front runners embracing further development and integration of technology in every area of the industry. Before getting carried away and having George fly us to the moon, though, there is another intelligence being overlooked that has even more miraculous potential: HI (human intelligence). While AI is a massive conglomerate of cognitive knowledge, MI involves extra-cognitive areas, that far surpass mental knowledge alone. This article introduces theories of human multiple intelligences, discusses the applicability to avi-

ation, and urges a focus on extra-cognitive intelligence development by offering starting points that can be adapted for use in aviation education and training.

II. THEORIES OF HUMAN INTELLIGENCES

2.1 TMI, EI, SI

Pilots Human success in the contemporary world is so tightly pinned to IQ and grades that education and workforce training has focused almost exclusively on educating the mind. In 1983, a groundbreaking Theory of Multiple Intelligences (TMI) was ushered in by Gardner which asserts humans have a variety of intelligences which can be continually developed to enable people to attain more of their full potential.

TMI proposes nine areas of intelligence: Verbal-linguistic, Logical-mathematical, Spatial-visual, Bodily-kinesthetic, Musical, Inter-personal, Intrapersonal, Naturalist, and Existential.

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In 1995, TMI was built upon by Goleman with the additional proposition of Emotional Intelligence (EI) involving five components: self-awareness, self-regulation, motivation, empathy, and social skills. Soon after EI was introduced, in 1997 Zohar posited that the ultimate composite and pinnacle of intelligence is actually Spiritual Intelligence (SI). Zohar and Marshall (2000) conceived of twelve qualities of SI that reflect a type of inner knowing which unfurls in the light of awareness that allows shifts in consciousness: “self-awareness, spontaneity, being vision and value led, holism, compassion, celebration of diversity, field independence, tendency to ask

fundamental why? questions, ability to reframe, positive use of adversity, humility, and sense of vocation”. Table 1 lists the components of the these three theories of intelligence which have expanded the traditional theory of IQ.

Wolman (2001) devised an SI measurement tool, the Psychomatrix Spirituality Inventory (PSI) that considered factors such as mindfulness, extrasensory perception, community, intellectuality, trauma, and childhood spirituality. SI is more than an advanced multi-layered asset for solving problems, Wolman (2001) explains, it joins together one’s “abilities, talents, gifts, and a transcendent interconnection of the

Table 1. Human intelligence theories

Theory	Creator	Year	Components
Theory of Multiple Intelligences (TMI)	Gardner	1983	<ol style="list-style-type: none"> 1. Verbal-linguistic 2. Logical-mathematical 3. Spatial-visual 4. Bodily-kinesthetic 5. Musical 6. Interpersonal 7. Intrapersonal 8. Naturalist 9. Existential
Emotional Intelligence (EI)	Goleman	1995	<ol style="list-style-type: none"> 1. Self-awareness 2. Self-regulation 3. Motivation 4. Empathy 5. Social skills
Spiritual Intelligence (SI)	Zohar	1997	<ol style="list-style-type: none"> 1. Self-awareness 2. Spontaneity 3. Being vision- and value-led 4. Holism 5. Compassion 6. Celebration of diversity 7. Field independence 8. Humility 9. Tendency to ask fundamental "Why?" questions 10. Ability to reframe 11. Positive use of adversity 12. Sense of vocation

individual human spirit with a larger, luminous universe that is the source of our being. Spiritual intelligence implies the capacity to think with one's soul...".

2.2 Applicability to Aviation

While AI may perform lightening fast computations and help determine things that humans require time and undisturbed focus to figure out, AI's limitations are clear in considering how intelligences overlap. A 2009 study on fighter pilots' intuition related to decision-making using the model of somatic marker hypothesis (Damasio, 1996) revealed that intuition is a skill based on the interplay between emotions and physical changes within the body (Hoogendoorn et al., 2009), hence a skill requiring multiple intelligences that might be impossible to construct in non-sentient AI interfaces.

2.2.1 Developing MI to counter side-effects of AI

Pilot error is the top cause of aviation accidents (McFadden, 2003), and AI may be doing less to mitigate and more to cause it than intended. As the activities of modern life become more automated, less cognitive output is required; this can result in a reduction in mindfulness, less connection to the task at hand, and an overall loss of meaning in one's work. Over-reliance on AI, or "automation addiction" (Lowy, 2011), plus issues of complacency and distraction are all ways in which seemingly helpful AI can actually be a detriment on the flight deck. Additionally to pilots' nearly inevitable "degradation of manual skill" that is not helped by the more serious issue of automation design (Geiselman et al., 2013), the adage of insensate material things having a mind of their own is of extreme concern in cases of pilots not being able to control errors induced by automation such as runway incursions and altitude deviations (Reynolds et al., 1994).

2.2.2 MI on the flight deck

Among Gardner's nine intelligences, those most obviously applicable to the aviation flight deck are Verbal-linguistic, Logical-mathematical, Spatial-visual, Bodily-kinesthetic, Interpersonal, and Intrapersonal. Pilots interact verbally using very specific linguistic codes, and mistaken use of language can be a factor in accident causation (Cookson, 2009). As pilots safely guide the aircraft through the skies, they are utilizing logical-mathematical skills for tasks such as optimizing flight routes and gauging altitude. Spatial-visual skill comes into play constantly for pilots as they stay continually cognizant of where the aircraft is in relation to other things on the ground and in the sky. There are kinesthetic aspects to flying a plane, from precise micro-movements in operating the plane to the physical control required to maintain a seated position in a confined space for an extended period of time. Pilots need seasoned interpersonal skills to communicate with crew members, passengers, and flight control under both calm and hectic situations. Most uniquely, pilots in the course of a single flight, go through continual intrapersonal challenges confronted with events and decisions that easily trigger emotional reactions and responses to issues requiring immediate resolution.

Goleman's five components of EI are all highly applicable to pilots, as their calm and quick responses and decisions in challenging situations directly affect the comfort, if not mortality, of passengers and crew onboard. An EI skill such as empathy may help a pilot determine how, and whether, to announce issues such as turbulence so the message can serve to comfort passengers rather than cause unnecessary panic. General empathy indicators, such as courteousness and intentional attention, among flight crew members are also known to positively improve team performance and help maintain an organized atmosphere on board (Park and Hyun, 2021).

Not only is it important for those controlling a flight to be alert, mindful, and calm in the face of danger, so they can make wise split-second decisions, it is important for such qualities to be continually sustained. The strict conduct pilots are expected to follow, such as controlled sleeping schedule and restricted alcohol consumption the day prior to flight, go towards promoting an ideal physical preparedness for flight. The emotional factors of preparation are more nebulous to externally control. Many pilots suffer from anxiety, depression, and other stressors that can affect performance and lead to demerit or dismissal. Fortunately, emotion-centered mental health issues have proven possible to control and decrease by non-pharmaceutical means, through interventions like mindfulness meditation and simple holistic methods, such as EFT which combines the stimulation of acupressure points with a series of verbalized reflections that lead one to reframe a particular emotional or physical discomfort in a positive, productive, and emancipating way.

2.2.3 MI pilot profile

Along with every theory of human intelligence, there are coordinated tools being used to measure individuals' varying levels. A 2018 study involving aviators and college flight students utilized the MIDAS instrument and found that similarities in scores account for a "pilot profile" (Overchuk & Niemczyk). The areas both aviation specialists and students scored highest on were Intrapersonal and Spatial Intelligence. The conclusion urged that considering the intellectual strong areas of this particular profile can benefit aviation educational strategies.

2.3 Starting Points for MI Development

Goleman asserts that our other intelligences can indeed be developed and doing so is in our great interest, "Emotional intelligence can be

learned and applied to meet goals and targets, as well as create a happier and healthier working culture" (Big Think, 2018). EI development courses are offered through Goleman's website (www.danielgoleman.info), and he is pursuing many avenues through research and education initiatives to help people of all ages improve the competencies of EI towards a kinder, more positively connected world.

In approaching the development of other extra-cognitive intelligences, the interconnectedness of body and mind is a key element. When energy flow in the body is optimal, a person feels alert and energized. However, if the body is experiencing pain or discomfort, or a person feels lethargic and fatigued, it becomes hard to focus the mind and attention. Exercises and practices that both bring the body and mind into more balanced states naturally influence the development of multiple intelligences. Whether techniques are more outwardly oriented towards movement or inwardly towards stillness, whether corporeal or mental, intelligences such as Bodily-kinesthetic, Spatial-visual, Intrapersonal, Emotional (particularly the components of self-awareness and self-regulation), and Spiritual may be simultaneously affected. Table 2 differentiates between body-centered and mind-centered approaches to developing MI. The sections following Table 2 then go into further detail about techniques, known effects, and specific resources that may be useful in exploring MI self-development.

2.3.1 Meditation and mindfulness

Successfully used throughout the world in every imaginable field, meditation practices which developed over the course of centuries, as part of every major religious tradition, are currently being introduced as secular, non-denominational, practices which can be just as easily oriented towards wellness as spiritual aspiration.

Table 2. MI development approaches

Orientation	Techniques
Mind - Centered	Meditation Mindfulness (MBSR)
Body - Centered	Yoga Qigong (Spring Forest Qigong) Acupressure Eden Energy Medicine (Daily Energy Routine) Emotional Freedom Technique (Tapping)

Mindfulness is one type of meditation practice where awareness is focused with attention to sensate experiences with a meta-cognitively unbiased stance of non-attachment. Research into the effects of mindfulness have found that its practice, aside from creating measurable changes in the brain, helps students' performance suggesting that it can effectively improve cognitive functioning (Mrazek et al., 2013).

The shift in consciousness that meditation and mindfulness practice can bring about is a cornerstone of developing aspects of spiritual intelligence, which is helpful for integrating the growth and development of other intelligences.

With near endless entryways into understanding and practicing meditation and mindfulness, figuring out where to start could easily overwhelm a neophyte either looking to quickly gain useful tools to help with acute mental-health disturbances and work-related problems or to develop new habits towards improving overall well-being. A wonderful aviation-specific resource is Mindful Aviator (www.mindfulaviator.com), founded by seasoned career pilot and Certified Mindfulness Teacher, Captain Carl Eisen. Mindful Aviator offers free content as well as subscription courses aimed at anonymously supporting aviation crew members with teaching strategies for reducing stress, developing calm confidence, enhancing situational awareness, general resilience, and overall performance. The Mindful Aviator introduces mindfulness and MBSR (mindfulness-based stress reduction),

a training system developed by Kabat-Zinn which was introduced in his landmark book *Full Catastrophe Living* (1990). MBSR helps one hone the ability to enter and maintain a mindful state of being. It has been proven extremely successful in the field of well-being, helping countless individuals and target populations cope with vast arrays of clinical and nonclinical problems or crises (Grossman et al., 2004).

2.3.2 Movement and body-oriented techniques

Pilots of certain aircraft are five times more likely to experience neck or back pain than the general population, and many are reluctant to report pain or injury for fear of repercussion (O'Connor et al., 2020). While stretching and physiotherapy may be two commonly used interventions to reduce and counteract musculoskeletal injury among pilots, there are other movement practices easy to incorporate into daily routines which also aim to increase body awareness, optimal energy flow in the body, and mental balance.

Among physically-oriented movement practices, yoga and qigong are two examples that work holistically with body and mind. Yoga is known to improve mental as well as physical flexibility, and it has been proven successful at alleviating the severity of a wide range of physical and emotional issues, including those most common among pilots: depression, fatigue, anxiety, and stress (Büssing et al., 2012).

While noticeable improvements stemming from

regular mind-body practice may subtly accumulate over time, there are also instantly effective energy hacks that can be used on the spot to aid in rebalance or give a boost of energy.

Acupressure is an ancient Oriental technique wherein points that lie along energy meridians are pressed to release blockages and restore the free flow of energy in the body. The 14 main meridians relate to the major organs, muscle groups, specific areas, as well as attributes of the physical, emotional, and spiritual body. The Stomach 36 point is known as the 3-mile point, and was used to instantly reinvigorate soldiers who were physically exhausted marching in combat and felt they could not walk any further. This point on the outer leg below the knee is easily accessible from a seated position and useful for instant rejuvenation or relief from exhaustion.

Qigong energy movement practice works with the Meridiens, using many simple quick techniques that have been used since ancient times to help with every imaginable physical or emotional issue. A helpful resource is Spring Forest Qigong. The founder, Master Chunyi Lin, has created many series of videos explaining qigong techniques for both general well-being and specific issues. Master Lin aims to empower people to heal themselves and others, his vision is “a healer in every home and a world without pain and suffering¹⁾”.

Similarly grounded in the Oriental Medicine five-element theory and the meridian system, as well as seven other energy systems related to the body/mind/spirit, Eden Energy Medicine is an approach to healing that is being used worldwide from homes to hospitals. The YouTube channel, Donna Eden Energy Medicine (<https://www.youtube.com/@theedenmethod>) offers nearly 700 videos teaching simple techniques for instantly rebalancing and restoring energy,

optimal mind functioning, and happiness. Particularly recommended are the five-minute daily energy routine (DER) videos which include a mix of techniques that work with all energy systems in a quick, easy-to-follow format.

A third technique which uses specific points along meridians to create instantly notable changes in energy and mood is EFT (Emotional Freedom Technique), commonly referred to as Tapping. EFT incorporates verbal cues along with physical stimulation of points in a specific looped sequence. The verbal aspect of EFT introduces an influence on verbal-linguistic intelligence and spiritual intelligence. The most prominent SI quality that comes into play in EFT is the ability to reframe. The basic protocol begins with subjectively measuring the intensity of an issue, be it emotional disturbance or physical pain, and then proceeds with a process of verbally exploring the feeling and currently presenting effects of the issue. Slowly the quality of words shifts to express and embody the ideal desired state.

A euphoria often quickly grows as the disturbance is reframed, because the vision of the desired feeling becomes more prominent and offers emboldening encouragement. All twelve qualities of SI can potentially be influenced in the course of one simple tapping technique that takes just a few minutes.

III. CONCLUSION

Humans have the unique capacity for multiple intelligences, and the ability to develop them. As the aviation sector seeks to develop cognitive-based AI, it is vitally important to remember that while modern education worldwide is IQ-centric, inclining readiness en masse to give over the labor of slow thinking to quick-fix technology, other intelligences exist within the human being which are integral to fostering a

1) <https://www.springforestqigong.com>

positively functioning and peacefully interconnected humanity. Utilizing very simple experiential tools for the intelligence-wellness toolbox, more highly developed intelligences can be a helpful asset on the flight deck. Human intelligence is as worthy of research and development, if not more so, as AI. Considering how MI development can be integrated into education and training in the aviation sector is timely and useful.

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