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LETTER FROM THE EDITOR

Jan F. TERELAK

Dear Sirs and Madams,

I give you the latest issue as of the Editor-in-Chief of the "Polish Journal of Aviation Medicine, Bioengineering and Psychology" under my editorship, devoted entirely to information on various aspects of functioning of aviation medicine in the years 1928-2018, the personification of which in the last half-century is the Military Institute of Aviation Medicine (MIAM). The recollections of former MIAM employees, who have been cooperating with our magazine for many years, are aimed at recalling and retaining, if only for a moment, the important scientific and organizational events that took place in this unique scientific, research and clinical institution, which deals with important issues of health and therapeutic prophylaxis for the Polish military and civilian pilots. The articles have an in-house nature and their subject matter covers all specialties: medical, psychological and engineering, as well as some departments of the Institute. Particularly noteworthy are reminiscences of MIAM clients, whose representatives are outstanding personalities of Polish aviation in the person of general Jerzy Gotowała - former commander of the Polish Air Force and a well-known author of many books on the history of Polish aviation, and general Mirosław Hermaszewski - a pilot and the first Polish cosmonaut.

I hope that the presented historiographic material will be of interest to readers interested in aviation and space medicine and psychology in Poland, and will also be useful to historians of Polish aviation and cosmonautics in terms of flight safety and well-beeing. I believe that 90 years of Polish aviation medicine and psychology fits in well with the celebrations of the 100th anniversary of Poland's regaining of independence, the creator of which, just as in the case of the establishment of Polish aviation medicine

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in institutional form, was Józef Piłsudski, who on 7 January 1928, as the Minister of Military Affairs, issued an order to establish the Aviation and Medicine Research Centre, the tradition of which is continued by MIAM, as a result of further transformations[1].

Saying goodbye to our readers, I would like to thank them for their interest in the issues presented in PJAMBP, and also thank all authors who publish their scientific papers and research results in our magazine, I would like to thank them for their scientific contribution to the development of aviation and cosmic medicine and psychology.

I cordially recall professor Lech Markiewicz, former Editor-in-Chief of "Medycyna Lotnicza" and "Polski Przegląd Medycyny Lotniczej", who introduced me to the mysteries of editorial work, helpful in editing "The Polish Journal of Aviation Medicine and Psychology" and then in "The Polish Journal of Aviation Medicine, Bioengineering and Psychology".

I am very grateful for the cooperation of the professional team consisting of: Members of the Editorial Team, Scientific Council of the Magazine and the Reviewers. I would like to express my special thanks to the subsequent Editorial Secretaries: dr. Elżbieta Zakrzewska, Jacek Brzeziński, MSc., Krzysztof Łukowski, MSc. Eng. and graphic designer Izabela Szczepanik, MSc. Eng. for the good working atmosphere and professionalism.

I wish the next editor of PJAMBP, the Editorial Team and the Scientific Council further functioning of the Magazine, and the Readers many interesting and scientifically valuable reads.

Best regards,
Jan F. Terelak – Editor in Chief at PJAMBP

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1 DECYZJĄ NR 49/MON MINISTRA OBRONY NARODOWEJ z dnia 24 marca 1998 r. Wojskowy Instytut Medycyny Lotniczej przejmuje i z honorem kontynuuje tradycje: 1) Centrum Badań Lekarskich Lotnictwa 1928-1936; 2) Instytutu Badań Lekarskich Lotnictwa 1936-1939; 3) Laboratorium Sanitarno-Epidemiologicznego 1945; 4) Laboratorium Fizjologii i Higieny Lotniczej 1945-1946; 5) Centralnego Ambulatorium Medycyny Lotniczej ze Szpitalem 1946-1947; 6) Centralnego Instytutu Badań Lotniczo-Lekarskich 1947-1955; 7) Wojskowego Instytutu Naukowo-Badawczego i Doświadczalnego Medycyny Lotniczej 1955-1958.

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MILITARY INSTITUTE OF AVIATION MEDICINE IN WARSAW - DETECTIVES IN WHITE APRONS...

Jerzy GOTOWAŁA

Source of support: Own sources

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Abstract: The author, a retired general and former Commander of the Polish Air Force, shares with the Reader the recollection of the Military Institute of Aviation Medicine in Warsaw from the perspective of a military pilot - a former customer and patient of this Institute. The author's introspections are presented in the form of an interesting literary essay.

Keywords: Polish Military Aviation, Military Institute of Aviation Medicine in Warsaw, medical and psychological examinations of military pilots

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While still studying piloting in Dęblin, captain Kuryłło - a feldsher who dealt with minor ailments of cadets (called by us a "healer") on almost every occasion reminded us of the duty to defend ourselves against what he called the "disease of indifference". More or less, it consisted in "... *actively evaluating oneself and one's environment, breaking one's reprehensible behavior and appreciation of correct life. Since people in your profession must be able to think creatively, evaluate the situation and act quickly and precisely before anyone else. This in turn can be ensured by a correct, disciplined, and noble life. If you do not fall from the sky too early* - he used to say with his bushy eyebrows raised upwards - *you can live even a hundred years...".* Of course, we underestimated the ramblings of the old feldsher ("not even a doctor"), but soon he was to turn out to be an experienced, wise man.

After promotion and first months in the fighting regiment I could call myself an absolute layperson in medical sciences. But as I gained my aviation experience, I became more and more interested in the humanistic aspect of our "pilot behaviors", and at that time I often thought back to the reflections of old man Kuryłło. A wider, more serious, more engaged interest arose in me in the years 1976-1982 from necessity, when I was entrusted with the command of the fighter regiment, and later with a position of the chief of the Corps and the Air Force and Air Defense. After several months of commanding the regiment, I had already known that the thorough knowledge of individual pilots combined with daily observation of behavior was conductive to reveal personal traits, an early form of pathology, which must be quickly and skillfully prevented. At that time, during the annual tests at Military Institute of Aviation Medicine (MIAM) ("talented, group I"), I spent more time on talking with specialists, sharing my observations and expecting advices, guidelines on what to pay attention to in order to timely prevent the causes of air accidents, failures and catastrophes. What symptoms may indicate that problems are coming?

No one underestimated my interests, I found a lot of conversations very interesting, and the observations, remarks and tips - as it turned out many times later - had been accurate and very helpful: dr. R. Dąbrowa and dr. L. Kopka indicated the symptoms of risks connected with the functioning of the circulatory system, M. Wojtkowiak - the impact of overloading on the well-being of pilots, dr. K. Klukowski - spinal disorders, dr. J. Kubiczkowa - the impact of the frequency of high altitude flights on the body , dr. Z. Gierowski with dr. J. Domaszuk - the impact of exhaustion in aviation and the prophylaxis. Also dr. J. Hornowski, prof. S. Barański, prof. K. Kwarecki, dr. S. Milewski, dr. M. Chodorowski and dr. E. Marks added valuable remarks.

On the basis of wide information I had obtained that way, I adopted four basic principles in my work. I mainly paid attention to them in the case of instructor flights, organization of aviation training, exercises and ordinary everyday aviation routine.

The first postulate was to recognize and overcome fears. It is obvious that everyone, even "fearless airmen", are afraid of something. Loneliness and fear up in the air usually give rise to intrusive ideas about what can happen in a moment and definitely have a negative impact on well-being. And they are not rare among flying personnel at all, but they appear almost on a daily basis, almost constantly, always. But how to detect them in advance, how to free someone from overwhelming thoughts. Because they are often enough to cause anxiety, even fear. Meanwhile, young regimental general practitioners, as a rule, were not prepared to detect symptoms of "neurosis" in advance, symptoms occurring almost simultaneously: accelerated pulse, hypertension, light sweat, anxiety in the pre-flight examinations. But together with the squadron, flights commanders and instructors should notice it.

A pilot, who came to the conclusion that they cannot cope with some mistakes in the air, that they exceed their skills, usually avoids them, avoids situations in the air in which they can occur, after all setting traps for themselves which they sooner or later fall into. All the wisdom is to notice these conditions in time, to detect them. Because everything that is unknown is mysterious and usually arouses fear. But this fear slowly disappears when the stress situation is experienced in the presence of an accompanying person - preferably a colleague, a friend or an instructor. In turn, we used to consider familiar things as simple and ordinary, and the goal is to train such feelings. That is why the real difficulty was to detect the symptoms of anxiety in time and then to skilfully bring the pilot closer to the behavior of their older pilot-colleagues, instructors, for whom the availability of these skills was obvious. It was necessary to sensibly combine the "old and the young", the instructors and the students, in the air. And after a few casual training flights, the fear diminished noticeably until it finally disappeared.

The second postulate was associated with quite frequent cases of pain in the spinal region, almost always resulting from tension between the dorsal vertebrae, caused by overloads. They were usually intensified when young pilots advanced to the period of learning how to perform free piloting within

the zone in the training process. On the day of the flight they have performed on their own one - two zones, and we, the instructors, four - five each (!). It was not easy to cope with it, because it is not easy to deal with reaching 5-6 G multiple times during one flight, and also there is the bundle of nerves, whether in the upper, back location of the loop, or during an Immellman's, when the speedometer indicates 450 km/h. The introduction of planes with variable wing geometry - "MiG-23" and then "MiG-29" - to the army resulted in a great increase of overload syndromes and injuries mainly to the cervical spine. These high loads (compression forces) are responsible for the creation of accelerated degenerative changes in the intervertebral discs. Military Institute of Aviation Medicine demanded the modernization of the centrifuge that had been in operation so far. Dr. M. Wojtkowiak and dr. J. Domaszuk had postulated modernization of the centrifuge since the 60s - 70s. We had found the money needed and in 1991 we already had a brand new centrifuge, with an IBM PC monitoring of the "flight". This also created opportunities to modernize old and develop completely new, better, more efficient G-suits. Moreover: dr. M. Wojtkowiak, dr. J. Domaszuk and dr. K. Klukowski developed a series of relaxation exercises carried out on a hard, parquet floor with a medical ball under the knees and "rolling deep into oneself". Every two hours of physical education were started by the pilots by stretching the muscles of their feet, legs, abdomen and hands in the recommended position. Then the shoulders, neck and even face. Only after thirty minutes of such exercises they could move on to the much-loved team games. The pilots called it "taking off the bra" - but it helped.

The third health postulate was related to cases of alcohol abuse by pilots. Drinking itself is usually quite pleasant, but sobering is much worse - it usually brings about disappointment of some sort. In Poland, it has become a custom to blame other people, friends, colleagues and the most sophisticated circumstances for this. The reasons for air accidents in facilities are quite frequent, sometimes they involve failures, even disasters and ... they become a very important reason to drink. Meanwhile, as life has proved, it is not effective to instruct, even from the highest level of command, that no one can expect their own family and friends to understand this type of self-centered behavior and to understand making one's own impotence publicly visible.

Prof. S. Barański stressed very strongly the need to raise awareness, as often as possible, that it is a pity to ruin not only one's own body, but also the intellect in this way and, most importantly, to waste the prospects of long flying that every pilot has. This is what he considered to be the best recipe: "the best job is the one you like! The best recipe, as there is no pilot in our aviation who would not wish to fly and do anything but to fly, for as long as possible! And alcohol is, unfortunately, a temporary and poor assistant. And usually, sooner or later, it leads to deep addictions..." In extreme cases, aviation lost a few truly fantastic pilots every year. So it was necessary to instill in pilots the truth that it is beneficial to learn to live without it.

However, I considered depressive mood to be the most difficult problem to solve. Catapulting or catastrophe in the regiment is usually caused by doubts, despair, a sudden loss of energy, a noticeable weakening of will, sometimes a far-reaching bitterness. Suddenly, doubts and the feeling of lack of perhaps a positive solution from a similar situation in the air manifest themselves or even start to dominate in a person. Usually several pilots get sick immediately, others are overwhelmed by apathy noticeable to the naked eye, they sleep poorly, and suffer from fatigue. Lack of enthusiasm and willingness to act becomes noticeable. Because suddenly we have to say goodbye to a person who everyone in the "local aviation family" knew very well, whom they were flying with, valued, and who is now irrecoverably... lost. Usually it took time, a lot of time, to come to terms with it - a time that nobody in the combat unit had. It was necessary to look for and find a rapid solution in order to forget, to learn to live without them. In such situations, there were cases of deep and serious with the family concerning the future. Every pilot had to decide when and whether to return to flying at all. And if so, if one choses to continue to fly, how to find confirmation of one's personal, professional and piloting value in everyday work.

These discussions, these valuable tips and recommendations from Military Institute of Aviation Medicine specialists were the basis for revising the current way of thinking, rejecting circulatory, routine, fixed views, conservative perception of the aviation profession and considering it from a completely different angle. It was science supported by medical experience. Today we can say, that when I took command of the Air Force, the science which, from today's point of view, has brought positive results, has changed the way of thinking and behavior of the commanders of the aviation regiments. Truly excellent psychological criteria for aviation training, prepared by the Department of Psychology, were adopted in the army

with no reservations, in total, both at the school in Dęblin and by the instructors in the facilities. Since then, I have visited the office of dr. Z. Gierowski and prof. S. Barański every year familiarizing myself with a comprehensive analysis of the level of health of flying personnel, deficiencies, threats, directions of undertaken prophylaxis. I have put great emphasis on advanced prevention leading to the elimination of factors from the environment of flying personnel, which are exposed as harmful for well-being, health, fitness, atmosphere in facilities and intensive creation, promotion of conditions affecting the improvement of these factors. In secret, after such analyses, I have even once came to the conclusion that if the recommendations of this prophylaxis were carefully observed in the regiments - after all, anyone can dream - perhaps in the following year we would be happy to congratulate ourselves on getting rid of a significant number of these "issues".

We have always given great respect to all physicians, especially to our specialists from MIAM. But then, for few months we had been admiring "people in white", miracle makers from Zabrze, although the heart transplants of prof. Bernard had been applied in world medicine for three years then. They were slowly becoming a standard in the world, and it was a complete novelty in our country. After all, the moral dilemmas in the Polish parliament and in the media were widely recognized as resolved and in the first operations undertaken in the country it was discovered that what really matters was finding a donor that would meet the needs and ... time. That goddamn time, which always slips through our fingers too quickly.

When, due to simple human curiosity, I became interested in this problem, prof. K. Kwarecki in his office at MIAM made me aware that this extraordinary creature - a human heart taken out of the donor's body to give new life, must be transplanted within about three hours. Only three hours... Therefore it is necessary to make transplantations from donors who got caught by the unfortunate fate near the transplantation centers, i.e. Zabrze or Cracow. Moreover, in the clinic there was a needy recipient, who had been praying for a long time for an organ with appropriate parameters. And that is why there is such a small, even minimal number of operations performed in Poland. I came back to the command at Żwirki i Wigury street from Kwarecki with his words sounding in my ears, about how much our medicine loses, how much society loses, how much Poles lose. Because cases of clinical deaths were frequent in the entire country. The number of tragic accidents, including mainly road accidents, did not decrease at all, and was even increasing from year to year. And even the fastest car with emergency lights and signals, in a country without motorways and expressways, was not able to meet the challenge of "three hours". The only real means of transport in our conditions in this situation was an airplane and a helicopter. Although there was a medical aviation operating in the country, it was too slow and it had completely no possibility to transport the rescue team... with a sanitary service on board. These requirements were met only by a large transport airplane. The one that could be landed by its crew on both military and civil airports. A military one, of course, to avoid the communication bureaucracy that devours precious time and reduces the chance of the recipient receiving the transplant.

With the means of fast transport at its disposal, the Air Force Command suggested cooperation with the Cardiosurgery Clinic in Zabrze (prof. Zbigniew Religa), Cracow (prof. Antoni Dziatkowiak), the Medical Academy of Gdańsk (prof. Zdzisław Wojda) and the Children's Health Center in Warsaw (prof. Stanisław Januszewski). Since then, air transport crews, regardless of the prevailing weather conditions and time of day, Sundays or holidays offered help, carrying a sanitary car, medical crew and human organs. On Saturday, January 21, 1990, in the middle of the carnival night, the crew of lt. col. Stanisław Florek from the 13th platoon broke through an extensive snow storm, overcame atmospheric icing and luckily reached Goleniów near Szczecin, and then returned to Zabrze with such a valuable heart. In the morning there was a telegram on the desk *"The patient received a new heart, surgery was successful. On behalf of the medical team and the convalescent thank you...thank you...Thank you great Polish pilots! Religa..."*. Two months later, prof. Religa held a meeting with pilots during the annual Conference of the Armed Forces Flight Security. At the end of the lecture "The sense of illness, the sense of death, the sense of life. At the beginning of tomorrow's medicine" he helped us extremely in our health prophylaxis by stating without hesitation *"...especially you, the pilots, you have to follow the life model so that no diseases can reach you - fight for a life without diseases..."*. The theses of his speech were confirmed by the Head of Health Service of the Polish Army gen. Kaliwoszka, the Head of WIML col. prof. Stanisław Barański and his deputy col. prof. Krzysztof Kwarecki.

On Thursday, April 5, 1991, Military Institute of Aviation Medicine - located at Krasińskiego street - was visited by the Prime Minister of the Re-

Fig, 1. Visit of the Prime Minister Krzysztof Bielecki at WIML in 1991 (on the left - Air Force Commander Gen. Jerzy Gotowała, inside -col. prof. dr hab. med. Stanisław Barański, on the right - Mr. Premier).

public of Poland - Jan Krzysztof Bielecki. He came in the company of adm. Piotr Kołodziejczyk from the Ministry of National Defense and the Head of Health Care of the Polish Army.

Together with the commander prof. S. Barański we have presented our institution. He became acquainted with the Institute's specialties: low pressure chamber, microwave laboratory, physiological test, centrifuge. He looked at the hospital's treatment base, which included 200 beds, and then we took him to the room of the working flight simulator "JAPETUS".

At the moment, the physical and mental condition of the pilot (Captain Strigl) was being examined and hydraulic actuators, on which the pilot cabin was supported, made a loud noise when changing its position depending on the stage of the "flight". Bielecki halted dead right after entering the room. "- Damn it! Where is Spilberg? Are you shooting the second part of Star Wars?" Prof. Barański explained the computer system supporting aviation and medical research, combined with the analysis of purely psychological indicators, enriched with information on the speed and quality of response of the tested pilot. The simulator made it possible to obtain reliable information about the pilot's state of health and even to answer the following questions: how does the pilot of a modern combat plane behave in conditions of acceleration? Do they make mistakes and how many do they make? Are they likely to put the safety of flights in danger? Will they accomplish their tasks accurately and effectively while operating on the modern battlefield? Holding in his hand the tape recording of the physiological parameters of the tested pilot from the medical computer network, it suggested the objectivity of evaluating the performance of the task set for the pilot. - This is the basis for conclusions regarding the physiological condition of the tested pilot drawn under the supervision of specialists: instructor-pilot, psychologist, engineer and doctor. – "That's good…" - said prof. Barański, glancing on the wide printout tape, but he was most interested in the "JAPETUSA" flight simulator cabin, which was "walking on hydraulic feet".

Then we took him to the Institute's internal courtyard, presenting him the buildings in the rooms of which the computer tomography and magnetic resonance will be located in the future. Just at the moment when Jerzy Wojnar flew in from PZL-Okęcie in an "Orlik", low from the side of Powązki. - This is our new trainer plane - I informed the Prime Minister. The pilot put the plane in a dogleg, presenting the beautiful silhouette of the machine and immediately moved to the vertical position. At an ascending angle of eighty

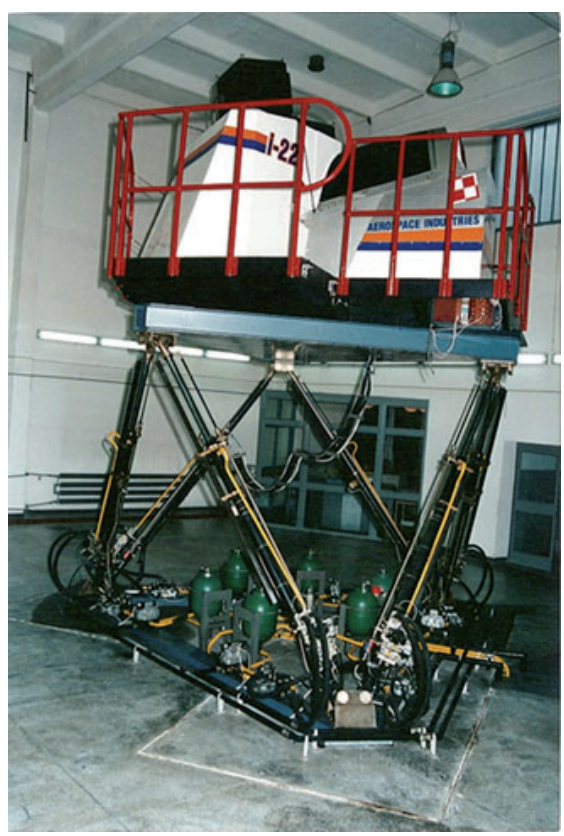

Fig. 2. Simulator "JAPETUS".

degrees he turned the "Orlik" in the other direction and over our heads he performed one loop after another. At the end of the fourth one he descended low and again from Powązki he moved upwards in an aileron roll.

- *"Are you satisfied with this machine?"* - he asked with concern. - *"Very much" - I have replied truthfully. - It is a plane for primary training, expected by the officer cadets of the "School of Eaglets" in Dęblin. The British and Israeli pilots already feel jealous about it... - "Oh! Is it our export product?"* - this time he turned to the director of PZL - Okęcie, Ryszard Leja.

- "*That is what we are hoping for, Prime Minister. We have inquiries from countries in South America, Israel and even China...".* He seemed to be impressed by the operation of the Institute. However, it soon turned out that despite assurances, he did not allocate any significant amounts to MIAM - *"Miser..."* - as Barański called the donor.

Usually at the end of October, prof. Barański used to invite people to WIML "for coffee" to present the health condition of the flying staff of the Air Force and Air Defense and to present the noticed threats, resulting from the comprehensive analysis of the research results. "The scale of morbidity among pilots" - he usually started optimistically - "has remained at the same, good level so far, and I dare say that this is the result of the medicine praeventiva" practiced by MIAM's medical staff in health prophylaxis units. Also our annual meetings. But the source of this generally not bad situation are not only doctors, proper operation of our health centers, MIAM or care for good supply of medicines for pharmacies near aviation facilities, but also the growing level of knowledge, education, and susceptibility of pilots for the rules of health prophylaxis instilled in them. Aviation commanders and pilots must not only know them well, understand them, but simply take them as a standard, as a habit like everyday tooth brushing, like morning gymnastics.

Despite the selection applied every year during the periodic examinations, several pilots are disqualified for health reasons. This year, nine of them... The Commission considers the negative impact of working conditions, both in quantitative and qualitative terms, as a major cause as usual. This is the result of completing training in each regiment of young pilots and the still low level of prevention methods and measures...". After such a general introduction, the Professor moved on to traditional issues: overweight, neuroses and neurogenic diseases such as coronary heart disease, heart arrhythmia and hypertension, spinal injuries and complaints of pilots from medical history. Specified in percentages, they painted a true picture of healthfulness. "Spinal disorders are mainly influenced by overloads and ordinary "wear and tear" processes, which can be permanently observed in a pilot at around the age of 40. This is the beginning of the future "inability" of instructors in particular. All these elderly people will soon be included in the third disability group...". Then he moved on to the personnel. "The management of Air Force and Air Defense Aviation - bad, requires an immediate refreshment. The management of 1 Air Defense Division of the Country (ADDC) - "facing extinction": Robak, Radoń, Bogusz conditional permission to fly on a reduced scale. However, this may result in reasons of accidents". "The management of 2ADDC - similar situation. Pasiewicz, Bil, Sygnowski..." - names that I knew very well were mentioned, sometimes even of my former commanders and instructors. It was not easy to take it uncritically. "The management of 3 ADDC - the situation is slightly better, but it also needs to be improved: Pawłowicz, Stolarski, Jaszek – also reduced activity, reduced overload during flights". "The management of 4 Corps' Aviation" - after last year's human resources refreshment, the situation is good. There are labor shortages, needing to be supplemented.

The health situation of pilots in battle regiments was usually good. There were individual cases of reservations, but here the supplementations from the school in Dęblin resulted in prof. Barański devoting more attention to the atmosphere in the facilities, to the premises for air accidents and preventive recommendations. For me, it was extremely important to evaluate the prophylaxis applied, the abilities of facility commanders to create an atmosphere of trust and support in the process of cultivation in the air, the care for young pilots and the mitigation of the pilotage overload of instructors. The Professor emphasized the results of developed "pre-pathology" - early detection and applied prophylaxis, prevention of disease.

This discussion, these recommendations and comments became the basis for the summary of the training year and the tasks for the next one. But I have discussed this more firmly and clearly with the Chiefs of Corps' Aviation and the regiment commanders. Whether this prevented us from accidents and catastrophes - it is difficult to estimate, it is difficult to define unequivocally, although certainly YES! Even the maximum saturation of flight crew with doctors will not improve the health of the flying personnel significantly, unless the level of compliance with prevention rec-

ommendations is appreciated, constantly raised and enriched by both biological and ethical values of the therapists, commanders, as well as the pilots. As prophylaxis equals shortcomings noticed in time and timely elimination of factors harmful to health and well-being from pilots' surroundings, as well as the persistent creation of conditions that support health. This is why the pilots left WIML after the annual examinations satisfied not only with the favorable verdict "capable, group I", but also with the colorful brochures on the prevention of basic diseases. Brochures containing information on how to live in order not to get ill, commented on and recommended by our doctors. It was precisely the detection of symptoms of flight safety hazards and the suggestion of preventive health measures that made me think of the detective search for hidden threats to the health of pilots, which were supposed to bring about and indeed brought about beneficial effects for aviation in terms of flying safety. MIAM personnel truly are detectives in white aprons...

AUTHORS' DECLARATION:

Study Design: Jerzy Gotowała; **Data Collection:** Jerzy Gotowała; **Manuscript Preparation:** Jerzy Gotowała. The Author declares that there is no conflict of interest.

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THROUGH THE MILITARY INSTITUTE OF AVIATION MEDICINE TO A JET PLANE AND A SPACECRAFT

Mirosław HERMASZEWSKI

Source of support: Own sources

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Abstract: General Mirosław Hermaszewski presents his reminiscences from the period of selection tests conducted at the Military Institute of Aviation Medicine in Warsaw, which aimed at selecting a candidate for the first Polish cosmonaut from among 72 military pilots. The author describes in an emotional way the medical methods and psychological tests, the results of which were the basis for selection. He also mentions episodes from further selection tests conducted in the "Star City" by doctors and space instructors in the USSR.

Keywords: Mirosław Hermaszewski, selection of a Polish candidate for space flight, exciting memories of people and facts encountered on the way of one of the Polish candidates for space flight

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In spring 1961 I was traveling by train from Wołów to Warsaw for my examination at the Military Institute of Aviation Medicine (MIAM) as a candidate to my dreamed-of School of the Eaglets in Dęblin. I could not sleep at night, I was very worried and stressed about the examination. I could still remember two previous failures at the Main Center for Aviation and Medical Examinations in Wrocław. I had undergone examination there twice with a positive result. The only objection was that I was short and underweight. After two years I had gained on weight a little bit and despite the lack of a few kilograms I received a certificate - capable as a candidate for glider training, but with a reservation to fly with an 8-kilogram bag of sand under my seat. It was an awkward situation for me. Nevertheless, I completed the glider training with a high flying time and with a distinction. I did not consider this situation to be my advantage, I was aware of the fact that a jet aircraft requires special health predispositions. At MIAM I met 72 candidates or so. From the first day we were taken under "care" of doctors and other specialists. New emotions and uncertainties appeared in front of each room. I noticed that doctors were not so much looking for healthy candidates, but rather for thosewith some imperfections. There were less and less of us every day. My emotions were rising. On the fourth day there were twelve of us left. Like convicts, we waited for the final results of the committee meeting. The chairman announced that only eight of the candidates passed the examinations. Emotions were at the zenith when they started reading out the names. When I heard mine, I didn't know which group I was in. I was given a certificate. I read it hungrily, and it stated clearly - "Mirosław Hermaszewski capable as a candidate for the Polish Air Force Academy". My joy was impossible to describe. Then, for many years, I underwent similar examinations each year and I never got rid of emotions, even though we were always treated with tender care as "friends". Every year more and more sophisticated procedures were applied, as new planes emerged, so the requirements were also growing. MIAM was responsible for the preparation and fitting of high altitude clothing for the MiG-21 supersonic aircraft, which I soon switched to.

A special experience for me was the extra examination of a group which I was assigned to in the middle of 1976. Candidates with special psychophysical predispositions and high resistance to stress and overload were to be selected. We were accommodated at the premises of MIAM without the possibility of contacting the outside world. The examination looked strange, it

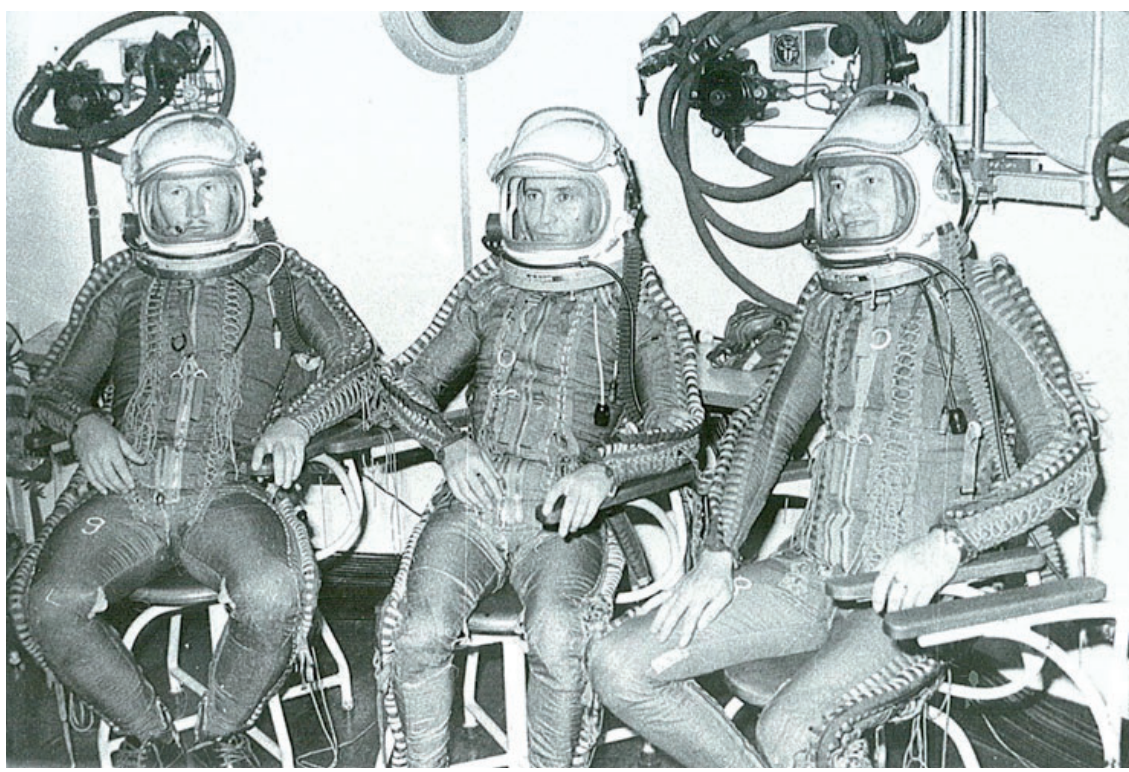

Fig. 1. Examination of candidates for cosmonauts in diving chamber (on the right - mjr Mirosław Hermaszewski, in the middle - lt. col. Zenon Jankowski, on the left - mjr Henryk Hałka).

was different than the annual ones and much more extensive. A doctor captain Krzysztof Klukowski was assigned to take care of the group. The main effort was put on psychological examination which was conducted with precision by Romuald Błoszczyński, PhD, with Jan Terelak, PhD, as his right hand, who established a "file" for each candidate in which he collected information from his own research and observations of other specialists. On this basis, he prepared individual characteristics of the candidates. A real "torture" was the extended laryngological examinations, led by prof. Janusza Kubiczkowa with a whole cast of specialists. Our labyrinths were tortured on "Barany chairs", on Rhõn wheels, gyroscopes and loppings until we lost the will to live. Hot and cold water was alternately poured into our ears and then the reaction of the labyrinth was tested. On overload centrifuges, terminal overloads were generated until we were losing consciousness. I remember that I was able to withstand overloads of up to 8.2g, which caused astonishment and disbelief in physicians - how is it possible with my height? Tests were repeated. The result was 0.1g better. In low pressure chambers we were "taken away" to a height of up to 12 thousand meters and psychological tests were carried out there. As if that wasn't enough, they put us in aviation high-altitude suits and provided us with pure oxygen to breathe, and then gradually replaced it with nitrogen. The experiment was interrupted only when the tested person gave ridiculous answers in the simultaneous psychological tests, or when pencil fell out of his hand and he fell onto his knees. Sessions in low pressure chambers were applied, and then sudden decompression occurred - the body was howling with pain and stress.

They looked into the bodies of the tested person in all possible ways. Biochemical analyses were conducted cyclically, and dr. Klukowski would check the pulse and pressure a dozen or so times a day. Before and after exercise tests, before bedtime, after awakening and whenever he wanted to. He had his "file" too and every day he reported to the commander of WIML, col. prof. Stanisław Barański. Many could not survive this race and left the group at their own request. After a month of exhausting examinations, only sixteen of us were left. During fiber-gastroscopic tests, many candidates were found to have bloody petechiae on the stomach walls, which was explained by the effects of many weeks of stress. On the last day of the examination, a doctor threw a suspicion that I had a hiatal hernia. I have never been diagnosed with this ailment and a special procedure was applied to exclude this suspicion. When fasted, in the X-ray room I was given a disgusting white gypsum-like pulp to swallow and a number of photos were taken when I was lying on my back, on the right side and with my head down. No anomalies were found. Soon we were told that this was not about a new type of some hyperplane, but a space flight. Our surprise and amazement had no limits. The next part of our struggle was the "fitness" camp in Mrągowo and Zakopane. There, dr. Klukowski, with his methods (running, exercise tests, skill tests, swimming, cycling time trials, sports games, "mountain tourism" - i.e. running on hiking trails, trainings in low pressure chambers, parachute tower water jumping, catapult training and permanent psychological tests - one day they included 998 questions), caused that after two months of drudgery only five of us were left. We came back to Warsaw to stand before a commission that came from the Cosmonaut Training Center in Star City. Its chairman, a doctor cosmonaut col. Vasily Lazarev analyzed the results of each of us. Together with MIAM specialists, four candidates were selected. There were no objections, but the commission decided that "in order to eliminate doubts" - the pulp and sessions in the X-ray room had to be repeated. The results were positive and so thanks to the head of the Internal Diseases Clinic, dr. Romuald Dąbrowa,

Fig. 2. One of the five millions of occasional stamps prepared by Poczta Polska with the likeness of the first Polish astronaut Mirosław Hermaszewski.

already in Star City, for the next six months during the monthly examinations I went through the procedure "to eliminate doubts". Unfortunately, my close friend lt. col. pilot Andrzej Bugała left the group. The following were qualified to further tests: mjr. pilot Henryk Hałka, lt. col. pilot Zenon Jankowski, lt. pilot Tadeusz Kuziora and mjr. pilot Mirosław Hermaszewski. The group of four went to Star City for qualification tests. There we met four candidates from the GDR and four from Czechoslovakia. As a result of a three-week tests, two candidates from the GDR and two from Czechoslovakia obtained a certificate of ability. All four Poles were found capable of space flight in terms of health and psychology, which was recognized as a perfect preparation of the candidates by Polish specialists from the MIAM. So Military Institute of Aviation Medicine did a really good job.

The final choice of the ones to fly was made shortly after returning to the country. But this is a different story.

AUTHORS' DECLARATION:

Study Design: Mirosław Hermaszewski; **Data Collection:** Mirosław Hermaszewski; **Manuscript Preparation:** Mirosław Hermaszewski. The Author declares that there is no conflict of interest.

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THE MILITARY INSTITUTE OF AVIATION MEDICINE IN WARSAW IN THE YEARS 2003-2016

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Abstract: The author - reserve colonel, psychologist, director of the Military Institute of Aviation Medicine in Warsaw in 2003-2016, presents his reminiscences on the adaptation of the Institute to NATO standards, both in terms of logistics and science and research. He devotes a lot of attention to new aircraft simulators and diagnostic devices, which increase the scientific and clinical potential of the Institute.

Keywords: Military Institute of Aviation Medicine mission, NATO standards in aviation medicine, flight simulators, international scientific cooperation, structural changes

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INTRODUCTION

The basic mission of the Military Institute of Aviation Medicine (MIAM) in the years 2003-2016 was to conduct effective selection and qualification of candidates of flying staff of the Polish Armed Forces, including early diagnosis and monitoring of medical condition and prevention aimed at maintaining the required psychophysiological condition for as long as possible, as well as aviation and medical training in aviation medicine and undertaking hospital treatment enabling to return to service in the air as soon as possible in the event of diagnosed diseases. The Institute was also to carry out tasks for the benefit of public defense and security, and the remaining resources were to be used for medical activity in the public health care system and in specialist certification conducted within the framework of commercial activities.

It should be noted that these tasks were carried out efficiently, despite various difficulties which occurred constantly. They manifested themselves in the form of numerous systemic and organizational turmoil, resulting mainly from legislative changes (in the form of significant changes in health policy at the national level, concerning not only civilians but also flying staff, as well as the broader military staff of the Polish Armed Forces), as well as in the conditions of operation of the Institute on the health market and scientific research. Examples of this turmoil included, for example, attempts to establish a MIAM consortium with other military institutions.

UNWANTED TESTS OF CHANGING ORGANIZATIONAL STATUS AND SCIENTIFIC WIML

Luckily, none of these attempts were completed and the Institute survived as an autonomous institution. However, they had negative consequences because qualified medical personnel started to doubt the stability of work at MIAM and if only a sensible job offer was found, they left, leaving a significant human resources gap. In this way, many valuable people left, including independent researchers. It is in this context that I will pay particular attention to the first attempt at merger, since it was widely publicized in the media and, in a sense, "implemented" in the form of the Regulation of the Minister of National Defense of December, 21, 2004. As a result, pursuant to Article 7 sec. 2 of the Act on Research and Development Units of July 25, 1985, the following research and development units are to be merged as of 1 January 2005: The Military Institute of Aviation Medicine with its seat in Warsaw, established on the basis of Order No. 04/MON of the Minister of National Defence dated May 21, 1955, the Military Institute of Hygiene and Epidemiology named after general Karol Kaczkowski with its seat in Warsaw, established on the basis of the Regulation of the Minister of National Defense of September 16, 2002 and the Military Institute of Medicine with its seat in Warsaw, established on the basis of the Regulation of the Minister of National Defense of November 27, 2002 on the establishment of the Military Institute of Medicine. The merger of the units was to take place through incorporation of the Military Institute of Aviation Medicine (MIAM) and the Military Institute of Hygiene and Epidemiology (MIHE) into the Military Medical Institute (MMI). The key to full understanding of the main idea of the considered regulation was the word "inclusion", which meant no less than absorption by MMI of both the Military Institute of Aviation Medicine and the Military Institute of Hygiene and Epidemiology. This meant that the incorporated Institutes lost their subjectivity, and in addition, many important structures and functions performed by MIAM and MIHE were not included in the structure of the newly established institution. As a result of the protest of the employees of MIAM and MIHE, as well as the Directors of these institutions and the negative vote of the Parliamentary Committee for the Ministry of Defense on the regulation in question, an unprecedented situation occurred in which a new regulation of the Minister of National Defense of 21 February 2005 was issued, repealing the previous one on the merger of the Military Institute of Aviation Medicine and the Military Institute of Hygiene and Epidemiology named after general Karol Kaczkowski with the Military Institute of Medical Sciences (MIMS). The further fate of the Institute was a consequence of this repeal, as without it, an independent scientific and research entity would not have existed. It should be noted that there were also other attempts to merge MIAM with e.g. the Polish Air Force Academy in Dęblin, in order to establish the Aviation Academy, as well as with MIHE. There were also ideas of merging MIAM with the Military University of Technology (MUT). Today, from the perspective of many years, it is necessary to consider where such initiatives came from and whether they only concerned the situation in Poland or had wider, international conditions. In some countries, including members of NATO, changes in the manner of operation of the

aviation-medical institutes occurred as well. Indeed, these changes consisted in the abolition of some scientific institutes and creation of centers of aviation medicine, the sole purpose of which was to provide aviation-medical training and selection tests in the field of aviation medicine and psychology for candidates for military aviation. And all research and development activities carried out for the army were taken over by specialized government agencies (e.g. DERPA in the USA and NLR in Netherlands). Also the issues of aviation hospitals were addressed in various ways (either made separate institutions or completely liquidated and the hospital beds were contracted to civil hospitals). It is in this context that the above-mentioned problems should be understood as questioning the traditional concept of operation of the Military Institute of Aviation Medicine, basing its operation on three pillars (hospital part, scientific part as well as medical and certification part) serving mainly the flying staff of the Polish Air Force. Why did such a questioning take place? This happened for many reasons, but the most important of them concerns the introduction of changes mentioned earlier in the health insurance of soldiers, as well as in the idea of the so-called "self-financing" of MIAM (also of other research institutes). In practice, this idea turned out to be difficult to implement because, on the one hand, it consisted in signing financing agreements for specific tasks (so MIAM became in a way a party forced to negotiate agreements with the military) and, on the other hand, it forced MIAM to intensively seek sources of additional revenue for all activities carried out under the statute in order to ensure a positive financial balance and liquid remuneration for both civil and military personnel. It was precisely the provision of remuneration to professional soldiers within MIAM's budget that was the most controversial solution. In this way, an additional type of soldiers was created, in a sense, who were not financed from the budget of the Ministry of National Defense. As part of these systemic changes, it has also become necessary to make the hospital area available to civil society and, consequently, to change the profile of treatment from military to civilian. Health services were provided on the basis of a contract concluded with the National Health Fund (NHF). One of the effects of this change was the lack of obligation to hospitalize flying staff for health reasons in the MIAM hospital area. As a result, patients belonging to the flying staff, military staff in general, constituted only a small percentage of patients admitted to MIAM. The main problem were the existing procedures of the National Health Fund, which did not meet the needs of the Polish Air Force. There were situations when flying personnel were diagnosed with ailments disqualifying them from provision of service in the air, which at the same time were not included in the procedures of the National Health Fund as a disease. This sometimes led to situations where pilots were not entitled to medical services because, in accordance with the regulations of the National Health Fund, they were healthy and at the same time suffered from ailments which disqualified them (at least temporarily) for health reasons. The soldiers themselves were given the opportunity to choose a "family physician", as well as the possibility of hospitalization in the civil health service, which indirectly resulted in a decrease in the effectiveness of systemic monitoring of the health condition of the Polish flying personnel, as well as other soldiers. This is one of the most important examples of such legal solutions which had negative consequences. This fact was frequently raised as an argument against the existence of MIAM in the present formula. Many military decision-makers, although aware of the legislative changes, did not accept this situation. I remember very well one of the meetings with the flying personnel in Dęblin, where I tried to explain the complexity of the operation of such an institution as MIAM. I have encountered reactions of misunderstanding and sometimes even reluctance towards such complicated rules of the Institute's operation.

THE ADAPTATION OF THE MIAM TO NATO STANDARDS

Therefore, the state of MIAM in 2003, both in terms of human resources and infrastructure, can be described as below an acceptable level, taking into account its importance for both the Air Force and the Polish Armed Forces in general. Hospital and institute buildings were in poor technical condition, needed urgent renovation, medical equipment in the hospital, but also laboratories and aviation-medical simulators were partly obsolete and worn out, not adapted to modern requirements connected to aviation medicine. The situation was aggravated by the fact that the Ministry of Science and Military Education granted the Institute a 5th scientific category (currently category C), which, as it turned out later, was the result of a technical error made at the stage of entering data into the evaluation questionnaire, in which the number of researchers was confused with the number of employees in general. The survey showed that MIAM had more than 300 re-

searchers, and that the proven extent of scientific achievements, with such a large number, was very modest. It proved to be very difficult to correct this mistake because the Ministry, for more than two years, did not want to consider it to be just a mistake. In fact, however, the Institute's scientific staff was largely based on older employees, which in turn was not only related to the systemic perturbations mentioned above, but also to the previous loss of the right to award habilitation degrees by MIAM's Scientific Council, as well as the liquidation in 1999 of the specialization in aviation medicine, replaced by the specialization in transport medicine. All these conditions resulted in the fact that MIAM's "opening balance" in 2003 was unfavorable, which also contributed to the attempts to merge it with other institutions. It should also be mentioned that, later on, the scientific evaluation of the Institute caused problems. MIAM's scientific and research as well as implementation achievements were not taken into account in the scope of evaluation criteria determining the scientific category to be awarded. This also applied to research and adaptation activities, which constituted the State's obligations resulting from the ratification and necessity to implement NATO standardization agreements (STANAG 3114, 3827 and others). Despite these difficulties, in 2013 we managed to reach the scientific category B, and already during the term of office of col. Ewelina Zawadzka-Bartczak MD - category A.

Going back to the past, however, I must admit that the idea of "self-financing" forced the need to constantly monitor the operating costs of particular MIAM structures and contributed to their reduction, as well as prompted us to look intensively for new sources of revenue. It was then that new opportunities for the development of the Institute emerged, in the form of the possibility of obtaining grants and scientific projects. However, it was connected with the implementation of new tasks. One of the most spectacular projects carried out at MIAM was the project of a new centrifuge, which was constructed at a MIAM of about 65 million PLN. It was, and still is, a thoroughly modern dynamic flight simulator - an overload centrifuge with the ability to carry out controlled training of combat flight elements, under conditions of variable acceleration, also with the use of night vision goggles. The technical and operational assumptions were developed at WIML and the simulator was constructed by AMST GmbH from Austria, which was selected through an international tender. However, also in this case there were some complications, because the implementation of this undertaking was interrupted by the Minister

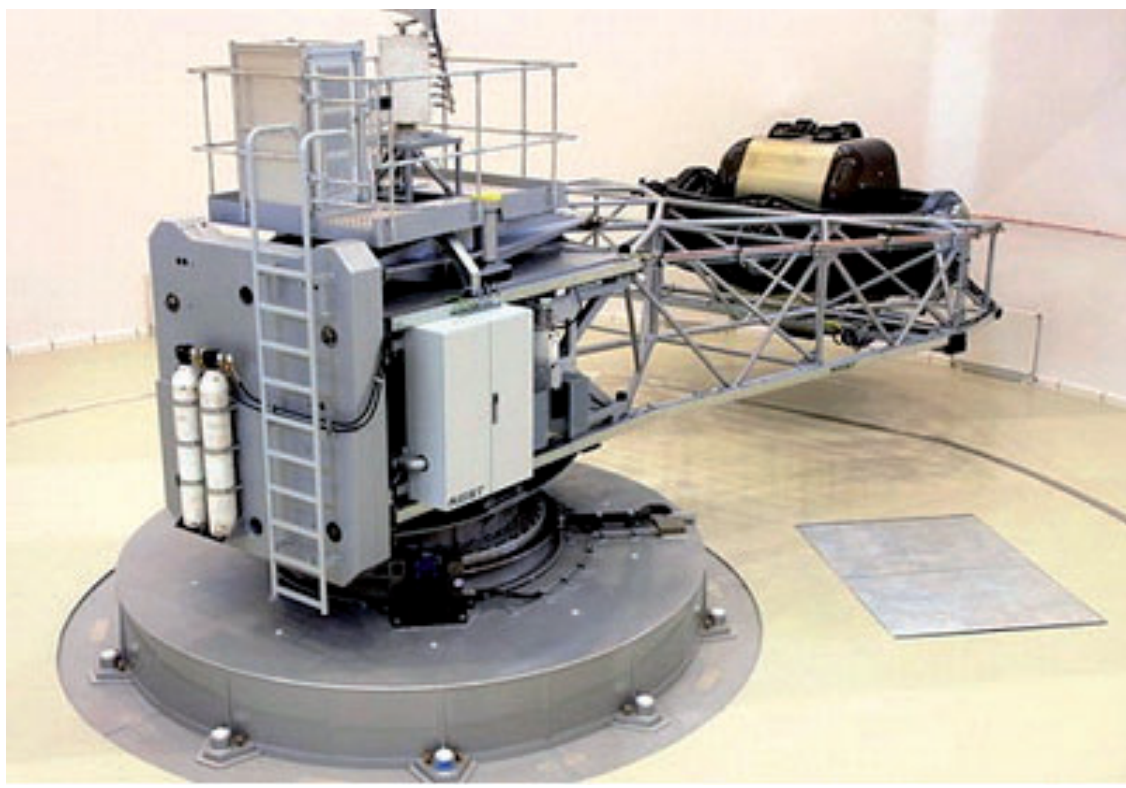

Fig. 1. A new MIAM overload centrifuge built by AMST GmbH from Austria.

of National Defense due to the ongoing financial crisis in Poland in 2008. Fortunately, after many interventions, the same Minister changed his decision and resumed the implementation of the project. As a result of these activities, one of the best devices of this type in the world was created. Training in this simulator was aimed at increasing the safety of flights on MIG-29 and F-16 high performance aircrafts. Aviation training using an overload centrifuge has become necessary to maintain a high level of readiness to perform tasks on high performance aircrafts and to increase overload tolerance, which is one of the essential elements in maintaining the safety of performing tasks in the air. For this reason, it was suggested to include aviation training on the overload centrifuge as part of the individual training of pilots of high performance aircrafts.

However, also in this case it was necessary to contract this task with the Air Force. Initially it was very difficult to conclude such agreements and it resulted in delays in the implementation of the new training. In turn, in 2010, MIAM modernized the power supply system for buildings together with the substations, which enabled the supply of power to the entire complex of buildings from two independent city switching stations in Warsaw and in case of a failure - the power supply from its own power generators. While in 2013, the program of adaptation to the requirements and modernization of MIAM hospital was completed. The building project worth PLN 34 million was completed with a grant from the Ministry of National Defense and, which should be emphasized, with MIAM's own funds (approx. PLN 11.5 million). The Institute obtained these funds by deciding to sell a part of its land. It was a very difficult decision, but in hindsight it was rational and right, because it managed to complete the prolonged renovation and gain important negotiating arguments when concluding the agreement for the hospital part with the National Health Fund. As a result a hospital part with 117 patient beds, 5 wards, including the Image Diagnostics Department was constructed, which is equipped with, among others, a 1.5T Philips Magnetic Resonance, 320-row TOSHIBA Computed Tomography and two digital X-ray cameras. The hospital was also equipped with a Central Operating Theater with three very modern operating rooms and a Central Sterilization Room. Other buildings included in MIAM were also successively renovated, which changed the Institute's image completely.

COOPERATION WIML WITH MULTIPLE SCIENTIFIC INSTITUTIONS

At the same time, activities aimed at activating the scientific part of the Institute were also carried out. Contacts were established with a number of scientific institutions. Cooperation with NASA resulted in the organization of a joint MIAM-NASA conference in September 2011 under the auspices of the National Security Office, the Polish Academy of Sciences and the Ministry of Science and Higher Education. During this forum, the issue of medical and psychological determinants of human activity in space, the impact of an unfavorable environment and high workload on human behavior, medical preventive measures and space crew training procedures as well as aspects of selection of crew for space missions were discussed. Another intention was to initiate international grants with a similar theme, but they have never been implemented. The next important undertaking was the cooperation of MIAM with the Nałęcz Institute of Biocybernetics and Biomedical Engineering of the Polish Academy of Science within the framework of the project "Center for integrated structural and functional research of the central nervous system" in 2012. Funds for its implementation were obtained from the National Center for Research and Development in the amount of approx. PLN 23 million. As a result, a new laboratory building worth PLN 7 million was constructed, equipped with 3T GE Magnetic Resonance together with a hyperpolarization machine and two EEG test offices. Further efforts in the field of science have resulted in the acquisition of many other scientific projects, such as: "Early fatigue symptom detector as part of improving the safety of driving a vehicle", "Mobile lab for investigating air accidents and catastrophes", "Evacuation and rescue system for victims of natural disasters", "Optoelectronic patient monitoring in magnetic resonance", "Psychological profile management system for soldiers with the development and use of "Health-Chips" technology". On the other hand, the implementation of the project "The system of monitoring the psychophysical parameters of patients in dynamic conditions WBAN based on microsystem technologies "within the framework of a joint project of the Institute of Medical Technology and Equipment, Warsaw University of Technology and the Military Institute of Aviation Medicine resulted in the Gold Medal with Honors at the 64th International Fair of Innovation, Scientific Research and New Technologies BRUSSELS INNOVA 2015. A test stand for Psychophysiological Testing

of Drivers with a truck cab was also constructed. Implementation of these and other research and development issues resulted in the creation of new workshops and laboratories (e.g. night vision laboratory, LBNP laboratory, CNS laboratory), and the equipment of scientific institutions with modern equipment (e.g. the Department of Aviation Psychology acquired the Vienna Psychological Test System (including equipment for peripheral examination, coordination and cognitive process examination, as well as equipment for psychophysiological measurements, including: Hi-Speed EyeTracking (SMI) and JAZZ-*novo* Multisensor). Particularly noteworthy is the Individual Warfare System Titan (ZISW Tytan), known as the "soldier of the future", which many people may imagine as a shield from science fiction films and laser weapons, but the Project Tytan would not have much to do with the comic book Iron Man. The creation and delivery of the system was the responsibility of a consortium of 13 Polish companies, including the Military Institute of Aviation Medicine, which was responsible, among others, for the construction of the soldier life monitoring module (MMZ).

Extremely significant structural changes initiated already in October 2002 concerned the certification part. As a result of legal changes , the Main Military Aviation and Medical Commission, which is an integral part of the Military Institute of Aviation Medicine in Warsaw (operating in a single instance) was replaced by the Military Medical Commission of the Air Force, independent of MIAM, as a second instance certification committee, and the Military Aviation and Medical Commission in Warsaw, acting as the first instance. In doing so, MIAM has lost the possibility of making commission decisions on the fitness of flying staff for service. Therefore, it became necessary to establish the Aeronautical and Occupational Medicine Certification Center (AOMCC), the main task of which was to conduct aviation and medical examinations of candidates and members of the aviation personnel in terms of their usefulness to perform the duties of aircraft pilot. In addition, the staff of the AOMCC was obliged to conduct prevention examinations within the scope of occupational medicine for the benefit of various entities interested in cooperation with MIAM in this field. It should be emphasized that since this center was established, it has generated significant financial resources contributing to the positive financial balance of MIAM. The decision to liquidate Military Aviation and Medical Commission - MIAM and create AOMCC aroused great controversy and opposition among many aviation physicians. Today, however, it has to be said that, due to legal changes in the field of certification, it has been correct and has allowed many jobs for specialized medical staff to be recreated.

At the end of this short section, selected in my memory from 90 years of the history of Polish aviation medicine and psychology at Military Institute Of Aviation Medicine, I will make "Polish Journal Of Aviation, Bioengineering and Psychology" readers aware of the structural and organizational conditions of the scientific, research and clinical institution important for Polish aviation.

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Study Design: Olaf E. Truszczyński; **Data Collection:** Olaf E. Truszczyński; **Manuscript Preparation:** Olaf E. Truszczyński. The Author declares that there is no conflict of interest.

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ACTIVITIES IN SUPPORT OF PSYCHOPHYSICAL FITNESS AND HEALTH PROMOTION OF MILITARY PILOTS – PERSONAL REFLECTIONS

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Source of support: Own sources

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Abstract: The author presents selected fragments of his research activity at the Military Institute of Aviation Medicine in Warsaw in the years 1971-2002. The author's career in aviation medicine began in the Department of Aviation Pathophysiology in the Laboratory of Flying Personnel Exercise Stress Tests with the position of Assistant Professor, then the Head of the Laboratory, next the Head of the Biological Renewal Team, then the Deputy Commandant of the Institute for Scientific Research, ending with the position of the Commandant of the Institute. The article presents in a condensed way the author's activity in the field of psychophysical fitness and health promotion, especially of military pilots. The main scientific interests of the researcher concerned the fitness preparation of pilots, including physical flight factors tolerance, changes in exercise capacity over age, methodology of exercise stress tests and setting standards of physical fitness, as well as health promotion with biological regeneration elements. Many new solutions, e.g. exercise stress tests in high altitude hypoxia, have been used in competitive sports.

Keywords: methods of diagnosing aptitude and physical fitness of pilots, fitness standards, health promotion in the Polish Air Force

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THE BEGINNINGS OF WORK AT MILITARY INSTITUTE OF AVIATION MEDICINE (MIAM)

After graduating from the Medical Faculty of the Military Medical Academy (WAM) in Łódź (1969) and completing a postgraduate internship at the CSK CKP WAM and WIML in Warsaw (1969-1971), I was sent, by way of distinction (third place at WAM), to work at the Military Institute of Aviation Medicine in Warsaw. The initiator of my work at the Institute was the then Commandant col. Zbigniew Jethon, MD, PhD, Associate Professor, who in 1968, when I was still a student of the fifth year, encouraged me to come to work at WIML. The commander knew about my additional studies at the University of Physical Education in Warsaw, and the condition for referral to the Institute was a high position after graduation. I knew that ass. prof. Zbigniew Jethon is a recognized aviation physician and experimental physiologist, as well as an authority in the field of physical preparation of pilots. That is why I was interested in the possibility of working at the Institute. However, the decision about my employment with WIML was made during a face-to-face interview (October 1971) by the new commander prof. Stanisław Barański, MD, PhD, Associate Professor, and the Head of Air Force Health Services col. Leszek Szymańczyk, MD. The fact that I graduated from the University of Physical Education in Warsaw, as well as close cooperation of WIML with Military Fitness Training Centers for flying personnel in Mrągowo and Zakopane, were the determinants of my new job, or military service in fact. Col. Zbigniew Sarol, MD, (Head of the Department of Aviation Pathophysiology), who was called to the commandant's office, convinced me of a better start in the experimental unit of the Institute and resignation from the idea of being a cardiologist in the clinical unit in the future. I took my first medical steps as a beginner physiologist in the Physical Performance Laboratory of the Department of Aviation Pathophysiology, under the supervision of the sports doctor and the exercise stress physiologist col. Zbigniew Dziuk, MD, with considerable help in the scope of exercise stress tests provided by major Bronisław Turski, MD, one of the best basketball players of the Military Medical Academy team. One of the employees of the Laboratory was also major Henryk Sulajnis, MA, a former representative of Poland in a modern pentathlon, which resulted in many years of cooperation and scientific work in the field of performance and fitness of flying personnel. Their pioneering work was supervised by a long-time collaborator of prof. Z. Jethon and a continuator of joint research – col. Zbigniew Sarol, MD, Associate Professor, Head of the Department of Aviation Pathophysiology.

In the years 1976-1978 I took an active part in preliminary preparations, qualification tests and special trainings of Polish candidates for cosmonauts. During this period, I held consultations at the Yuri Gagarin Cosmonaut Training Center in Star City and at the Institute of Biological and Medical Problems in Moscow, where I got acquainted with the methodology of qualification and selection tests for the purposes of cosmic medicine.

FURTHER CAREER DEVELOPMENT

In 1977, a student of prof. Julian Walawski – prof. Lech Markiewicz, MD, became the Head of the Department of Pathophysiology, who gave a new impetus to scientific work and actively supported future postdoctoral students (Mieczysław Wojtkowiak, Józef Domaszuk, Eugeniusz Sokołowski, Krzysztof Klukowski, Lucjan Golec, Bronisław Turski, Marek Kłossowski). All the aforementioned researchers, regardless of aviation medicine issues, were involved in the extreme environmental medicine and physical effort. This resulted in numerous joint works on the borderline between sports medicine, high altitude hypoxia physiology, hypergravity physiology, etc. At the initiative of prof. L. Markiewicz, I was appointed the secretary of the Commission for Work Physiology and Physical Activity of the Committee on Physiological Sciences of the Polish Academy of Sciences, bringing together outstanding researchers of applied physiology in Poland (prof. prof. Bolesław Gwoździ, Zbigniew Jethon, Adam Klimek, Stanisław Kozłowski, Ryszard Kubica, Eugeniusz Miętkiewski, Józef Sysa). In addition to my previous academic achievements so far, I prepared a habilitation dissertation. It concerned changes in physical fitness with age and their connection with risk factors of civilization diseases of military pilots, which I defended in 1984 before the Scientific Council of WIML.

As part of my further scientific and professional advancement, I became the Head of the WIML Biological Renewal Team (1985-1994), Deputy Scientific Commandant (1995-1996) and the Commandant of the Institute (1997-2002). In the years 1993-1994, I was also appointed Chairman of the Scientific Council of WIML. In 1994 I was promoted to the position of a titular professor. I received the title, wearing the gala uniform of the air forces captain, from President Lech Wałesa, thanking the President of Poland on behalf of newly appointed scientists and artists (Jerzy Stuhr, among others).

Within the framework of cooperation with col. Roman Maciej Kalina, PhD, and lt. col. Marek

Kłossowski, PhD, in 1995 we established, on the basis of WIML, the Physical Education in the Army Section of the Polish Scientific Society of Physical Education (Polskie Towarzystwo Naukowe Kultury Fizycznej - PTNKF). I am elected first President of the section (1995-2003), lt. col. M. Kłossoswki, PhD – Deputy President and col. R. Kalina, PhD – Secretary. The great advocate of the establishment of the military section was the President of the PTNKF prof. Tadeusz Ulatowski, PhD, great authority in the theory of physical education and sports in Poland, long-time rector of the Józef Piłsudski University of Physical Education in Warsaw. Thus, WIML became a center of innovative solutions in the field of physical education of uniformed services (the Police, border security forces, fire brigades, prison service). We organized numerous conferences in various training centers of defense formations, each time publishing post-conference monographs of informational and implementation nature.

Within the framework of cooperation between WIML and the Main Center for Aviation and Medical Research of the Polish Aeroclub (Główny Ośrodek Badań Lotniczo-Lekarskich Aeroklubu Polskiego – GOBLL-AP) in Wrocław, in cooperation with the director Janusz Marek, MD, in the years 1997-2001 we operated in the Physiological and Medical Commission of the International Federation of Aviation (CIMP-FAI). At the organized training conferences (Join-Meeting) concerning aviation sports, we presented the issues of injuries in parachute jumps as well as cervical spine overloads in air acrobatics. We implemented the latter topic together with col. Jan Talar, MD, (from 23 WSK in Bydgoszcz) [47,48,49].

PUBLICATIONS ON THE PSYCHOPHYSICAL FITNESS OF PILOTS

I owe my first scientific publications to the inspiration and help of lt. col. Zbigniew Dziuk, PhD, who offered me co-authorship in many works, at the same time exercising substantive supervision over my first works. Due to the cooperation between MIAM and Military Training and Fitness Centers (MTFC), active recreation of pilots had always been a great topic, in the context of military service burdens and in comparison with other types of military troops [5]. In 1974 I defended my doctoral thesis on the tolerance of flightenvironment factors and physical fitness of overweight pilots. The thesis was promoted by the commandant of the Institute, col. Stanisław Barański, MD, PhD, Associate Professor, a renowned scientist and specialist in aviation and space medicine. He was also a great advocate of conducting scientific work on the basis of WOSzK and introducing elements of biological regeneration to the training program for flying personnel. At the commanding officer's initiative, I was actively involved in the preparation of doctoral theses of WOSZK medical and instructor staff (lt. col. Aleksander Krzyściak, MD, cpt. Kazimierz Czuriszkiewicz, MA, cpt. Jan Marks, MA, - from WOSZK-Zakopane and lt. col. Marian Doraczyński, MD, from WOSzK-Mrągowo). Currently, my role in the promotion of successful doctorates at WIML and AWF (Cracow, Warsaw) would be described as an auxiliary promoter.

MILITARY FITNESS TRAINING CENTRES

In the air force, a lot of attention is paid in preparation of a professional pilot to the issues of physical performance and fitness, as well as to the issues of active recreation. This stems from the specificity of work (impact of physical factors of flight on the body, requirements of high altitude rescue, etc.), as well as the awareness of the need to maintain a high standard of health by pilots [18,27,39,44,50]. In this sense, fitness and performance indicators of flying personnel can be considered as positive measures of health [22,40,41]. Many MIAM studies have shown that an important achievement of all activities aimed at maintaining a good standard of health is the annual stay of pilots at military training and fitness centers (MTFC-Mrągowo and MTFC-Zakopane). They are used to supplement deficiencies in fitness preparation, to relieve adverse emotional tensions, to regulate calorific surpluses and to implement new forms of active recreation [27,39,44,50]. Substantive supervision over the above projects was performed by MIAM, through appointment of MTFC consultants team. It consisted of: a physical education specialist (Henryk Sulajnis, MA), a sports physician and physiologist (Krzysztof Klukowski, PhD), an aviation psychologist (Jan Terelak, PhD) and a nutrition specialist (Mieczysław Pędziwiatr, PhD). Initially, the team was headed by col. Henryk Sulajnis, MA, (1974-1979), and I was appointed to this position in 1980 (even before obtaining habilitation). It is worth mentioning that the widely understood physical culture would not be fully effective in preventing civilization diseases of the aviation personnel if it was not included in the comprehensive system of interactions of health education provided by specialists from MIAM. This includes projects aimed at rational nutrition, appropriate psycho-

physical regeneration, systematic physical activity, combating unfavorable addictions and periodic assessment of health status (performance and fitness tests, ECG exercise tests).

Military pilots are more prone to cervical and lumbar spine pain than other professional populations of healthy men [49]. Therefore, regardless of institutional activities (stay at MTFC, MIAM), pilots should regularly use various forms of biological regeneration on their own, which I opted for in relevant publications [25]. I believed that biological regeneration of pilots is not a fashion, but a necessity, integrated into their active and healthy lifestyle.

In the scope of creating health promotion programs and implementing health training for military pilots based on WOSzK, together with lt. col. Krzysztof Mazurek, MD, we established a long-term and close cooperation with Henryk Kuński, MD, Head of the Sports Medicine Laboratory of the Medical Academy in Łódź and the Provincial Sports and Medical Clinic, an outstanding expert in the issues of adult health training in Poland. It was also connected with many years of scientific and social ties with the team of doctors of the Laboratory (later professors: Wojciech Drygas, Anna Jegier, Tomasz Kostka). As a result of the cooperation, many elements of health training and practical experience of the Łódź team were transferred to military aviation [41]. Thanks to the initiative of col. K. Mazurek, MD, who was the President of the Main Military Aviation and Medical Commission at WIML, a system of exchange of medical information between WIML and WOSzK doctors was implemented. They were sending a list of the aviation staff, future participants of the training and fitness camp to the Chairman of the Main Military Aviation and Medical Commission. Preventive recommendations were made based on the pilot health indicators obtained during the last Main Military Aviation and Medical Commission examination

On this basis, the participants of the WOSzK camp used: a low cholesterol diet, appropriately selected sets of physical exercises and physiotherapeutic treatment. The final results of medical examinations and performance and fitness tests were forwarded back to the GWKLL computer database. On the basis of experience in special trainings conducted with pilots in WOSzK (special aviation gymnastic devices, ground catapult, low pressure chambers, etc.), a program of special trainings for Polish candidates for cosmonauts was developed at WIML in 1976 (col. ass. prof. Z. Sarol, col., Henryk Sulajnis, PhD). Psychological tests were also an important element of examinations as well as the choice and psychological selection of candidates for cosmonauts [51]. My task was to provide supervision and medical care over the classes conducted in WOSzK Mrągowo and WOSzK-Zakopane. During the two-week camp in Mrągowo I had 14 pilots of supersonic planes under my care. Basing on selection tests (psychological tests conducted by col. ass. prof. Romuald Błoszczyński) and earlier tests at WIML, 8 pilots were selected for further recruitment. At WOSZK-Mrągowo, all pilots were catapulted on the UTKZ ground device as part of their assessment of their task stress tolerance. I have also undergone this procedure with a view to better understanding how impact acceleration affects the pilot's organism. My feelings – after the shooting I was a bit stunned on the verge of unconsciousness, then for a few days I felt burning around my back, as if burnt by a hot iron. The next 14-day camp took place in WOSzK-Zakopane, and two new participants were co-opted to the group of 8 pilots, including the most experienced pilot lt. col. Zenon Jankowski. It turned out that despite his training backlog he did not have any fitness problems with reaching subsequent peaks in the Tatra Mountains.

TESTING OF NATIONAL TEAM ATHLETES IN A LOW-PRESSURE CHAMBER

Under hypobaric hypoxia (simulated altitude, hypoxia in the low-pressure chamber), physical exercise is associated with incomplete coverage of oxygen demand of working muscles and increased share of anaerobic metabolism. Similar processes are observed in combat sports. For example, in box there are loads in excess of 65% of the maximum oxygen uptake (VO2max – physical fitness indicator) and heart rate above 165/min. In boxing fights, heartbeats are close to individual maximum values. It was assumed (team coach mgr Andrzej Gmitruk, sports physician Lech Święcicki, sports psychologist dr. Jan Terelak) that submaximal exercise tests (heart frequency up to 165/min), performed under hypoxia conditions (simulated altitude of 3,000 m a.s.l.) could be helpful in assessing the state of training of the boxing team. The study covered 18 boxers of the Olympic team preparing for the Summer Olympic Games in Seoul. Among the athletes undergoing tests were Dariusz Michalczewski and Andrzej Gołota, then still promising young athletes, and later world-class professional boxers. The load pattern on the bike ergometer corresponded to a three-round (3 minutes each) boxing fight. In the heart

rate-load biofeedback, the FIZJOTEST-801 device was used, the first version of which was tested in Mirosław Hermaszewski's flight in the "HEALTH" experiment (pre-flight and post-flight tests) [32]. The boxers were tested in the Low Pressure Chamber at the Military Institute of Aviation Medicine in the Department of Aviation Pathophysiology [24,46]. It was shown that decreases in average power and volume of work in hypoxia conditions are dependent on the state of training, because boxers with a higher degree of training did more work, had lower decreases in power in individual rounds and tolerated higher values of lactic acid concentration (they could lead to a more intensive level of fight). This helped the coach to set the intensity of the boxing fight in each round individually for each competitor. Andrzej Gołota returned from Seoul with the bronze Olympic medal.

SUMMARY OF PUBLICATION ACTIVITIES

The basic directions of my research interests related to the issues of physical culture and the evaluation of pilots' exercise capacity, presented in numerous publications, were:

- the problem of performance preparation of pilots, including physical flight factors tolerance [2,3,12,16,23,33,34,36];
- the role of MTFC in improvement of psychophysical condition and biological regeneration of pilots [11,18,25,27,43,44];
- changes in exercise capacity with age and its impact on work ability [17,20,21,42];
- methodology for exercise stress examinations related to submaximal tests used in qualification and periodic health examinations of pilots [9,13,28,37,38];
- flying personnel performance and fitness standards [6,10,19,26];
- biological regeneration of flying personnel [4,5,14,29,39];
- selected issues of physical education, sports medicine and aviation medicine [7,14,30,35,45];
- physical activity in health promotion [22,30,40,41];
- physical preparation of candidates for cosmonauts [1,15,31,32].

FINAL REMARKS

Being unable to agree with the then command of the Polish Flight-and-Air Defense Forces on the restructuring of WIML (the dispute concerned the abandonment of scientific activity in favor of maintaining financing from the clinical hospital budget), in 2003 I left the reserve and took up employment as an academic teacher at the Józef Piłsudski University of Physical Education in Warsaw. I was offered a job at the University of Physical Education by the Rector Elect, Andrzej Wit, MD, PhD, Associate Professor, at the instigation of col. prof. Roman M. Kalina, PhD. Col. Krzysztof Mazurek, MD, also took up, with my intercession, work at the University of Physical Education, for whom no job was found at WIML after previous transfer to the reserve. Initially, I worked as a full professor at the Institute of Tourism and Recreation at the Faculty of Physical Education, then I was appointed Vice-President for Promotion and Sport (2003-2005). In the years 2005-2006 I became the head of the Department of Physiology and Biochemistry at the Faculty of Physical Education, and then I changed the faculty and from 2006 to 2012 I was the Head of the Department of Physiotherapy at the Faculty of Rehabilitation.

The scientific events worth remembering include my speech including the Allard Lecture in 2005 in Warsaw at the International Congress of Aviation and Space Medicine. The lecture concerned the issues of tolerance limits of the human body in extreme conditions of hypoxia, gravity and interplanetary flights. I consulted the content of this lecture with prof. Andrzej Trzebski, MD, Dean of the Division V: Medical Sciences of the Polish Academy of Sciences. The presentation recalled, among others, the contribution of great Poles to world science and the records of Polish aviators (including sports ones). The aforementioned lecture is treated in the world of aviation medicine as the highest honorary distinction for the aviation doctor of a given country, awarded with a special medal.

In 1987 I was appointed a member of the Physical Education Science Committee of the Polish Academy of Sciences, and after the reorganization of the committees I was elected Vice-Chairman of the Committee on Rehabilitation, Physical Education and Social Integration of the Polish Academy of Sciences (2009-2015), and since 2016 I have been the Chairman. Also in the years 2003-2005 I was the President of the Polish Society of Sports Medicine (since 2016 I have been the Honorary Member).

Taking into account my entire activity in the field of physical education, sports medicine and rehabilitation, in 2013 the senate of the University School of Physical Education in Wrocław awarded me the title of doctor honoris causa. In the conclusion of the eulogy, prof. Marek Woźniewski, PhD, said, underlining my achievements: "...in recogni-

tion of the merits in the development of aviation medicine and sports medicine, as well as medical rehabilitation and the exercise stress physiology, and in particular the promotion and worthy representation of the physical education sciences and consistent care for their position in the scientific community, please accept the highest academic dignity awarded by the University School of Physical Education in Wrocław...".

To conclude my reflections, by necessity highly reduced, I certainly did not manage to mention all the people to whom I owe the opportunity to find out the scientific truth and fascination with aviation and space medicine. However, I certainly owe my most important achievements to my work at the Military Institute of Aviation Medicine and the possibility of meeting great people from military and civil aviation, as well as outstanding physical culture figures in Poland.

AUTHORS' DECLARATION:

Study Design: Krzysztof S. Klukowski; **Data Collection:** Krzysztof S. Klukowski; **Manuscript Preparation:** Krzysztof S. Klukowski. The Author declares that there is no conflict of interest.

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RECOLLECTION OF THE AVIATION PHYSIOLOGY LABORATORY AT MILITARY INSTITUTE OF AVIATION MEDICINE FROM THE PERSPECTIVE OF 50 YEARS OF PILOT PERFORMANCE RESEARCH

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Abstract: The author after graduating from the Medical Military Academy in 1965, he was sented for a postgraduate two-year internship in medicine at the Military Institute of Aviation Medicine (WIML), which he partly completed there and partly at the Second Central Clinical Hospital of the Medical Military Academy (WAM). After the internship he was sented to the Air Force Institute of Technology to work in the position of a senior physician of the infirmary. After less than two years in 1969 he was transferred to the position of an assistant professor to the Laboratory of Aviation Physiology at MIAM. The paper deals with the characteristics of scientific and application activities of the Laboratory of Aviation Physiology at WIML in the years 1969-1996. The subject of research was, among others, the assessment of physical performance and its impact on the effectiveness of the operation of pilots and cosmonauts in extreme conditions. The research was carried out with the use of many flight simulators, such as: thermo- and diving chamber, centrifuge, and also in laboratory conditions (e.g. stationary bikes) and in water (lakes) or mountain (Tatra Mountains) natural conditions. Moreover, the effects of vibrations on the functioning of helicopter pilots were also dealt with. As part of space medicine, a prototype of a vacuum capsule was created, the essential element of which was a "vacuum collar" (mounted around a pelvis of the tested person), enabling the capsule to be under-pressurized to the required level at the lower half of the body.

Keywords: aeronautical and space physiology, body fitness, flight simulators

INTRODUCTION

The paper deals with the characteristics of scientific and application activities of the Laboratory of Aviation Physiology at Military Institute Aviation Medicine (MIAM) in the years 1969-1996. The subject of research was, among others, the assessment of physical performance and its impact on the effectiveness of the operation of pilots and cosmonauts in extreme conditions. The research was carried out with the use of many flight simulators, such as: thermo- and diving chamber, centrifuge, and also in laboratory conditions (e.g. stationary bikes) and in water (lakes) or mountain (Tatry Mountains) natural conditions. Moreover, the effects of vibrations on the functioning of helicopter pilots were also dealt with. As part of space medicine, a prototype of a vacuum capsule was created, the essential element of which was a "vacuum collar" (mounted around a pelvis of the tested person), enabling the capsule to be underpressurized to the required level at the lower half of the body.

A BRIEF OUTLINE OF THE HISTORICAL LABORATORY

I trained and broadened my aviation and medical knowledge under the direction of Zbigniew Sarol, MD. At that time I was directed to the performance laboratory, where the methodology of physical performance testing on a stationary bike was introduced and where under the direction of Zbigniew Dziuk, MD. and in cooperation with Krzysztof Klukowski, MD. we conducted military research on aircraft personnel, using the methodology of physical performance assessment according to Astrand, Sjöstrand, the precursors of this research. The assessment of physical performance was based on a study of oxygen uptake during dosed physical activity calculated according to a formula that was modified by applying an age factor that took into account the Polish population. An assessment table for performance of aviation personnel was developed, which has been taken into account in the assessment of the general health status during the periodical examinations at the Aviation and Medical Commission. This type of research was carried out during the fitness camps, which were held alternately in Gronik/Zakopane and Mrągowo in Mazury.

In addition to performance and fitness tests, MIAM also provided training and preparatory courses for the aviation medicine specialization. These allowed me to obtain first and then second degree of specialization in aviation medicine. At the same time, the pilot's body tolerance to hypoxia was tested by performing various types of tests in the low-pressure chamber, using different methodologies. The basic method was a half-hour stay of the pilot in the chamber on a simulator of an altitude of 5000m (pressure of 405mmHs). Experimental tests of physical performance were also performed at various simulated altitudes in the low-pressure chamber with simultaneous exposure to low or high ambient temperatures. The result of this research was a doctoral thesis entitled "Effects of altitude hypoxia and low ambient temperatures on the pilot's body" (1975).

RESEARCH APPARATUS IN THE LABORATORY AND RESEARCHES

MIAM had at their disposal several chambers, including a diving chamber where 12 pilots could be tested simultaneously. Moreover, the chamber center had a thermo-diving chamber, which allowed to obtain high values of hypoxia and at the same time, depending on the needs, it could be combined with high or low temperatures even of +/- 47 °C. An important element of the aviation test was the barofunctional examination, i.e. obtaining the appropriate height in a short time and relatively quick descent from high altitudes to the normal ground pressure. The so-called rapid ascent and descent made it possible to assess the condition of the auditory system, especially after acoustic injuries or chronic inflammatory infections. Under the supervision of very experienced doctors in the field of chambers - assistant professor Eugeniusz Sokołowski, assistant professor Lucjan Golec, scientific experiments of various types were performed on animals and the research of aviation personnel could planned with precision. Research was developed on the so-called reserve time, i.e. on human tolerance to hypoxia. The research consisted in breathing a mixture with a small amount of oxygen, corresponding to an altitude of up to 7000m. The psychological test concerning visual attention consisted in subtraction of numbers from 1000. The errors that occurred indicated the amount of reserve time of the examined person until the moment of loss of consciousness. The results of these studies correlated with the results in the low pressure chamber.

An important element of aviation-medical research was the determination of overload tolerance of aviation personnel in various programmes - linear or intermittent. Depending on the needs, the programmes which were an element of a com-

prehensive assessment of the psychological and physiological condition of the flying staff were applied. Both the results of tests in low pressure chambers and on overload centrifuges as well as tests of physical performance were assessed together with the results of clinical trials as a complex assessment of the health condition of each pilot.

At the same time, the routine test for flying personnel was to determine the overload tolerance. Adequate overload tolerance, especially in the +Gz axis (head - lower limbs), was an important element in assessing the orthostatic tolerance of a pilot and their suitability for the profession of a pilot. Among the scientific studies undertaken, an important topic in aviation in the 1970s were vibrations, occurring mainly on helicopters. They became a challenge, as some pilots often reported ailments, resembling the so-called vibration syndrome. Research of the flying personnel was undertaken, especially of helicopter pilots, where vibrations sometimes exceeded the standards in individual helicopter locations - floor, steering stick, pilot's seat. During the periodical examinations, plethysmographic examinations of the upper and lower limbs were performed, combined with the reaction of the vessels to low and high temperatures, in order to check the reactivity of the peripheral vessels under specific conditions. Moreover, a palesthesiometric test was used - the vibration sensing threshold test. Research was also carried out in aircraft facilities, e.g. in Pruszcz Gdański, where Mi-24 helicopters were stationed. The tests mentioned above were carried out prior to and shortly after the flights. The vibration intensity was measured at various points of the helicopter. Excessive vibration levels were found on the deck, on the control stick and on the pilot's seat. An intervention at the manufacturer (USSR) resulted in improvement of these conditions. The results of tests at MIAM as well as aircraft facility confirmed an increased reactivity of peripheral vessels, however, no symptoms typical for vibration syndrome were found. During this time, the average annual helicopter flight time did not exceed 150 hours, which resulted in the absence of clear symptoms of disease. In addition to the intensity of vibrations, the time of exposure to vibrations, which in this case was small and could not cause significant lesions, plays an important role in the occurrence of symptoms.

As the head of the vibration laboratory, I have developed a multidisciplinary methodology for assessing the effects of harmful vibrations. In this study, peripheral cardiovascular tests (plethysmography, skin thermometry), palesthesiometry, EMG, eye fluorescein angiography, biochemical tests (free fatty acids, cholesterol), hormonal evaluation and bone radiograms were carried out. Conclusions from this study were used for an in-depth analysis of the mechanisms of changes in vascular, nervous, osteo-articular and hormonal systems. Among other things, proper work hygiene was applied, observing the hours of exposure to vibrations during flights, and after intensive flights, rehabilitation procedures were applied for pilots. A rehabilitation office for pilots was established in Pruszcz Gdański. In the 1970s, my main interests in aviation medicine were focused on the influence of overloads affecting various parts of the body during flights on new type of supersonic aircraft (Mig-23, Su-7).

THE CHALLENGES OF GRAVITY MEDICINE

Moreover, just before the flight into space of the Polish cosmonaut, I took part in the preparations of the entire group of candidates of ten members, who were subjected to complex, widely programmed research. This several months' long health selection carried out by dr. Krzysztof Klukowski, selected two candidates who successfully passed all the tests and verifications.

Mjr Mirosław Hermaszewski's space flight was the success of many doctors at MIAM. At the beginning of the 1980s, WIML engaged in a subsequent, broad scientific topic. As part of this problem, it was necessary to create a device of one's own design, a vacuum capsule, which was subject to certain technological constraints at the time of its creation. The most important element of this device was a vacuum collar, which was installed around the pelvis of the tested person, tightly, not permeable to air, but at the same time enabling the capsule to obtain the desired negative pressure. The negative pressure generated around the lower half of the body of the desired level allowed to simulate the orthostatic test, creating the conditions for transport of blood from the head to the lower parts of the body. A lot of papers prepared in the team, among others by dr. Dębiński, dr. Kuzak, dr. Żebrowski, were presented at national and international congresses (e.g. Reno, USA, 1996), and were very well received. As a result, MIAM was appointed to organize the World Gravitational Congress in Poland, which was held in 1997 with a very good result.

ORGANIZATIONAL ACTIVITY

In 1984 I passed a specialization exam in the first degree of internal diseases at the Central Hospital for Veterans at Military Medical Academy (MMA). Specializations in internal diseases and previously passed 1st and 2nd degree exams in specializations in aviation medicine made it much easier to work in contact with the aviation personnel and allowed for undertaking a number of scientific works where technical knowledge was necessary. At the end of the 1990s I passed a specialization exam in transport medicine. In 1992, I became the Deputy Commander of MIAM for Medicine and I held this position until 1996.

In 1997, I was sent to work outside MIAM at the position of the Director of the Defense Department of the Ministry of Health, and then I was transferred to the Inspectorate of Health of the Ministry of National Defense to the position of Chief Sanitary Inspector - Deputy Head of Health Care of the Polish Army. At the end of the 1990s, I took up a job at the Main Military Aviation and Medical Commission, where I dealt with issues related to the causes of the inability of aviation personnel to serve in the air for health reasons. In the years 2001-2002, as a specialist in transport medicine, I organized courses for physicians who acquired the right to examine drivers and candidates for drivers, as well as for examination in order to obtain the right to possess weapons. I was then offered a position of the Head of the Aeronautical and Occupational Medicine Certification Center (AOMCC), which I took in 2002. It was a big organizational challenge, because it was necessary to organize the work of the center almost from scratch and create the scope of aviation and medical research. As the manager of a large area, I have set up a multi-specialist team to develop the principles of examinations of the aviation personnel, and to extend the methods of research to include modern research techniques. The result of many years of research was the Aviation and Medical Research Instruction prepared by the above mentioned team, submitted for evaluation to the Inspectorate of Military Health Care and the Ministry of National Defense.

In 2012, together with my colleagues from AOMCC, I took part in the development of the methodology of testing candidates for the Aviation High School, which is a preliminary selection of suitability for subsequent candidacy for the Air Force Officer School.

DISTINCTION

On the occasion of the 90th anniversary of WIML I was awarded in 2018 by the Director of WIML for my 50 years of work at MIAM.

AUTHORS' DECLARATION:

Study Design: Bronisław Turski; **Data Collection:** Bronisław Turski; **Manuscript Preparation:** Bronisław Turski. The Author declares that there is no conflict of interest.

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THE MEMORY OF THE SENIOR POLISH GRAVITATIONAL MEDICINE ABOUT HIS WORK AT THE MILITARY INSTITUTE OF AVIATION MEDICINE IN WARSAW

Mieczysław WOJTKOWIAK

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Abstract: The author, a pilot and aviation doctor, recalls the 60 years of work at the Military Institute of Aviation Medicine in Warsaw. An overview of scientific and application works, which contributed to the development of aviation medicine, is presented. Special emphasis has been placed on research activities related to the influence of impact accelerations on animals and humans. The author discusses in detail the methods of research of pilots in overload centrifuges and their dynamics of changes in connection with the development of modern jet aircraft and space science. For health reasons, prof. Mieczysław Wojtkowiak's work was developed by dr. Rafał Lewkowicz on the basis of scientific articles written by M. Wojtkowiak, associates and personal conversations with him.

Keywords: acceleration tolerance, animal centrifuge, human centrifuge

Figures: 5 • **References:** 91 • **Full-text PDF:** http://www.pjambp.com • **Copyright** © 2017 Polish Aviation Medicine Society, ul. Krasińskiego 54/56, 01-755 Warsaw, license WIML • **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education

"I was born in the year in which our Institute was founded.
Perhaps this coincidence has made me associated with MIAM since 1957,
allowing me to make my dreams come true".

/Prof. Mieczysław Wojtkowiak, MD/

MY WORK FOR AVIATION MEDICINE IS THE PASSION

Aviation became my passion at an early age. In 1939, I witnessed an air combat in the early days of World War II. This was the moment when my passion for flying and the desire to learn it were born. After the World War II, as the Poznań Flying Club was reactivated, it became my first aviation training center.

Following fast-track completion of Karol Marcinkowski Secondary School in Poznań, I received a matriculation certificate in 1948. In the same year, I started medical studies at the Faculty of Medicine of the Medical Academy of Poznań. In study-free time, I continued aviation training on gliders and powered planes available at the Flying Club. As a result of my aviation activity, I obtained qualifications and a certificate of a glider and powered aircraft pilot as well as a certificate of the second-class parachute jumper.

In 1950, I was employed as an assistant at the Department of Physiology of the Medical Academy of Poznań, giving lectures and teaching classes to medicine and dentistry students while also holding the duties of a tutor for student groups. I also continued aviation training at the Poznań Flying Club. Being aware of my interests in aviation, my superior, professor Edward Czarnecki, decided to pursue aviation medicine-related subjects at the Department of Physiology of the Medical Academy of Poznań. To this end, I established collaboration with the Director of the Central Institute of Medical Examinations for Aviators in Warsaw, professor Władysław Okniński, and in 1950 I was sent there for my aviation medicine training. While still a student, I completed a course in aviation medicine which was my first contact with this field of medicine. By that time, I had already become a fully qualified aviator. My teachers included professor Stanisław Marczewski, an ophthalmologist professor Władysław Pol, and other specialists employed at the institute. I retook this course in 1952 and obtained the befitting certificate. Staying at the Institute deepened my interest in aviation physiology. Having obtained the knowledge in aviation medicine, I was fully prepared for education at the Medical Academy of Poznań.

After I completed the studies and received my degree in medicine in 1953, I was drafted for military service. Following the necessary military training, I was appointed a senior physician at the Military Academy in Legnica. After one year's service at this position, owing to my aviator qualifications and by the decision of the Commander of the Air Force Medical Service, col. Bielicki, and the Air Force Commander, gen. Turkiel, I was transferred to continue service in the Air Force. In 1955, I became a senior physician of the Aviation Training Regiment at Krzesiny. There, having received the approval of the Air Force Commander, gen. Frey-Bielecki, I underwent aviation training on JAK-18, JAK-12, JAK-11 and TS-8 planes and obtained the military pilot certificate. Most of my flights were performed on TS-8 BIES planes. During my duty at Krzesiny, besides conducting routine examinations of the aviation personnel, I also carried out my first research studies involving the analysis of physical burden of pilots at different flight conditions, mostly in relation to pre- and post-task reaction times.

Fig. 1. Lieutenant pilot Mieczysław Wojtkowiak.

Finally, in 1957, having obtained practical expertise in the medical service at the air force, I started my research career at the Central Institute of Medical Examinations for Aviators in Warsaw (currently the Military Institute of Aviation Medicine) as a senior assistant at the Department of Physiology. Two years later I was appointed an Associate Professor at the Aviation Pathophysiology Division. In the same year, I obtained the second-degree medical specialization in aviation medicine and started my medical researches. One of my first research concerned the effects of acceleration on biological structures with special reference to the changes of body parameters [18]. It was an assessment of the respiratory tract functioning, especially a fundamental parameter, i.e. Tissular Respiratory Index, being a very sensitive indicator of the metabolic disorders. Ultracentrifuge used for the organic mixture fractional separation, being able to generate several thousand rotations per minute, was applied for investigations of the gas exchange in the isolated hepatic tissue under the action of +40 to +8000 Gz.

In 1965, I obtained M.D., PhD. in philosophy from the Scientific Board of the Medical Academy of Warsaw having defended my doctoral dissertation titled Selected physiological reactions in pilots subjected to in-training punchouts. This way I started my scientific career in MIAM, which I developed for the next half of century. During this time, my scientific interest and studies focused on the following four subject groups:

1. Studies on the effects of short-term acceleration occurring during emergency and training ejections.
2. Studies on the physiological reactions of humans and animals to various types of acceleration.
3. The search for novel methods for examination and assessment of systemic tolerance to acceleration.
4. The use of physical factors and physiological reactions to increase the systemic tolerance to acceleration.

VERY SHORT-DURATION ACCELERATIONAS AN IMPORTANT PROBLEM OF EXPERIMENTAL INVESTIGATIONS

The first subject group consists of the studies of the effects of short-time acceleration occurring during ejections on pilots' bodies. In these studies, first of this type to be conducted in Poland, T. Jasiński (psychologist), T. Drobisz (engineer) and I focused on physiological and psychological reactions of humans subjected to high acceleration [16,27,52,78]. As the results of the studies, we observed a number of changes related to the reactions within the cardiovascular system and the release of catecholamines and 17-ketogenous steroids due to excessive stimulation of the sympathetic nervous system. The conclusions of the studies conducted together with Z. Podgórski and J. Domaszuk were presented in numerous publications [42,52,67,82]. As shown by the findings presented therein, even short-duration acceleration stimulates the pituitary-adrenal hormonal axis, largely dependent on the accompanying stimulatory excitations and emotions. Notably, the increase in hemodynamic reactions and hormonal secretion is a good indicator of psychological excitation in emergency situations, also in flight situations.

Significant emotional excitations of subjects provided the ground for introduction of emergency ejection trainings to prepare pilots for abandoning their planes in a safe manner. Being the only Polish researcher authorized to perform ejection trainings, I personally conducted all tests using the training ejection device. I was also the first subject, who ejected himself 18G with a full cartridge gunpowder, from a newly developed ejection device UTKZ.

Another article published by the same group [69], focusing on the distribution of body centers of gravity in relation to the G-force vectors, was of particular theoretical as well as practical importance. Together with the co-authors, I determined the pilot body positions which, when adopted in the ejection seat, may result in the risk of spinal injuries. This study, which received the third-degree prize in the research competition announced by the Minister of Defense served as the basis for my expert's opinion on the changes introduced to the design of ejection seats in training devices.

Also of practical importance were the results of studies carried out together with T. Jasiński and S. Szajnar [31,32,76], concerning optimization of the ejection process, as it was demonstrated that the efficiency of the seat ejection system could be improved in relation to the conventional solutions. In the studies, we presented a method for solving the problem of reduction of gravitational forces experienced by the pilot during the seat ejection phase.

Further conducted scientific assessment of the effects of impact of G-forces upon rapid restrainment falls from height in the devices aimed at preventing falls of humans working on elevated structures. I also analyzed the risks of spinal fractures due to improperly worn harness gear. These studies were conducted in collaboration with the occupational safety experts of the Central Institute

for Labor Protection in Łódź. Moreover, together with J. Domaszuk, A. Truszczyńska and R. Lewkowicz, I also studied the issue of spinal pains in pilots and the methods to prevent them [11,34,35,87,89].

SLOWLY INCREASED AND EXTENDED ACCELERATIONS AS A NEW RESPONSIBLE CHALLENGE

The second group of studies focused on the reactions of humans [80,81] and animals [17,68,90] to various acceleration conditions. Most of these studies were team efforts of numerous authors studying these problems worldwide. A number of hemodynamic, electrophysiology, radiology, radioisotope and morphological methods were applied in these studies. Most studies focused on hemodynamic disturbances due to blood flowing in the direction of the G-force vectors and to the stasis of blood within the vessels, organs, and tissues.

As far as animal studies are concerned, worthy of note was the introduction of a new Polish centrifuge for animals (fig. 2a) with the feature of liquid nitrogen-freezing of animals subjected to acceleration. I was also involved in the development of the guidelines regarding the technical requirements of this centrifuge. Introduction of the animal centrifuge made it possible to conduct studies on animal tissues and organs which are inaccessible in case of human studies. The methodology of the studies consisted in determination of the location of intravenously administered isotopes and the assessment of this location in organs and tissues (fig. 2).

Studies conducted in collaboration with S. Barański, Z. Edelwejn, Jurczak, Czerski, Domaszuk and Stojanowski involved examination of Wistar rats (fig. 3) in various experimental settings [1,3,12,56,85]. This allowed for determination of hemodynamic disturbances resulting from acceleration of varied durations; the results of the animal studies were published as scientific articles [6,7,8,9,18,53]. The aforementioned studies allowed for the formulation of following conclusions:

- In centrifuge settings, displacement of systemic fluids and proteins of varied molecular mass occurs as confirmed by isotopic examinations [3,9];
- In repeated experiments involving long durations of exposure to G-forces, capillary hypertrophy and dilation of extracellular spaces occur together with an increase in permeability of vascular walls resulting in morphological changes within the muscles, kidneys and liver as confirmed by isotopic assays following prolonged hypodynamia [7,8];

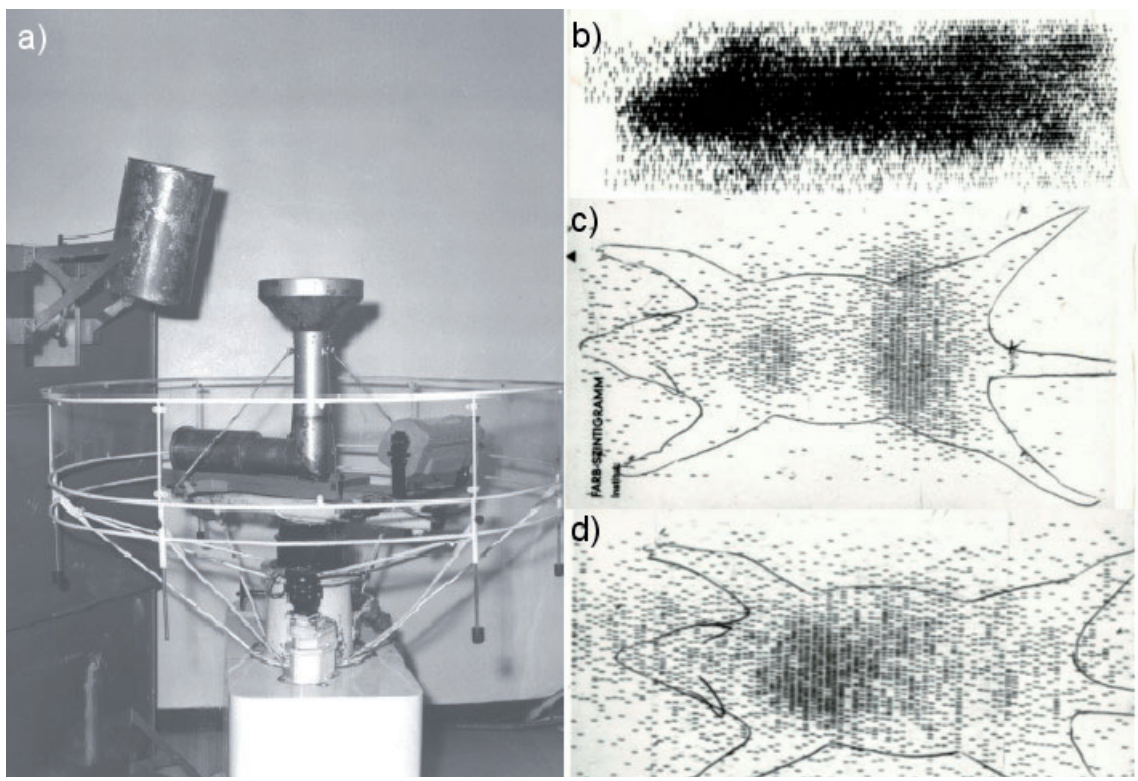

Fig. 2. a) The animal centrifuge (examination of rats following intravenous administration of radioisotopes in an isotonic solution); b) Administration of radioactive sodium (22Na); c) apparent blood displacement (131I-albumins) in simulated zero-gravity conditions; d) caudal dislocation of blood (51Cr-globulin) under a directional gravitational force.

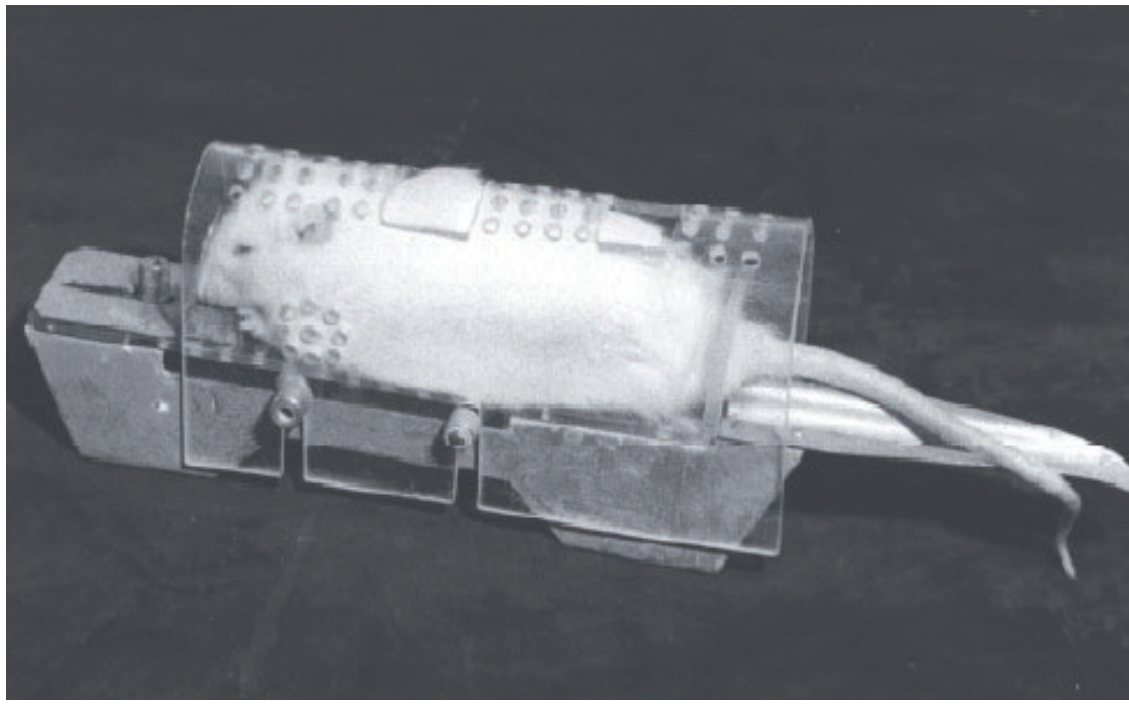

Fig. 3. Rat placed in the animal centrifuge cabin cage.

– Change in rat's position involving pelvis being elevated at an angle of 30 degrees led to prolonged hypodynamia imitating zero-gravity conditions, muscle ischemia and plethora of the organs within the upper part of the body. The disturbances in the muscular circulation in limbs are maintained much longer than those within the kidneys, liver and brain; on the other hand, no dilation of capillaries occurs in pulmonary circulation;
– Hemodynamic and bioelectric disturbances within the skeletal muscles as observed upon centrifugation are much stronger when observed after long-term hypokinesis (fig. 3).

The behaviors of the circulatory system exposed to extreme acceleration exceeding the maximum tolerance of humans were also studied in aggressive baboon monkeys (fig. 4). The studies were carried out in collaboration with Z. Edelwejn who assessed the brain function. The objective of those studies was to assess the behavior of the circulatory system after the maximum tolerance of acceleration manifested by G-force induced loss of consciousness (G-LOC). Therefore, it was interesting to study the changes in the function of the circulatory system increasing up to the threshold of animal's death. After resuscitation, the circulatory function went back to normal. The acceleration used in the studies was adequate to those used in the line training of pilots, thus confirming the epistemic value of these studies of extreme circulatory disturbances that occur following a prolonged loss of consciousness.

The analysis of changes in circulatory function in the critical phase was particularly valuable as it allowed for the assessment of the heart resilience. Results of studies [14] conducted together with Z. Edelwejn and K. Kwarecki allowed to monitor hemodynamic disturbances increasing in proportion to the acceleration. This practical aspect of the results consisted in the gravitational force exposure program corresponding to the characteristics of stimuli used in the evaluation of acceleration limits in pilots [10].

The analyses of cardiac arrhythmias in pilots undergoing human centrifuge evaluations may also be included in this group of studies [15,21,29,83,90]. In collaboration with German researchers: W. Papenfuss, G. Kollande, D. Wirth and G. Ponisch [30,41,77], I proposed a classification of this types of disturbances including their incidence rates and described their importance in aviation medicine certifications. Similar studies were conducted in cooperation with L. Kopka [20] in a group of 80 pilots, five of which experienced a G-LOC. Physiological changes observed in these pilots were described in detail via cardiological analysis to observe that the behavior of the cardiovascular system during the centrifuge tests depended largely on the status of the autonomic nervous system.

Rapid changes of potentials within the system observed during the tests in the conditions of cardiac ischemia are very valuable for the assessment

of the efficiency of the electrical conduction system of the heart. In addition, we observed that a reduction in the heart rate occurring already at the increasing G-force phase is a signal of disturbed compensation capabilities of the electrical conduction system and an indication for immediate discontinuation of the test.

In another studies conducted together with E. Marks, W. Zużewicz [29] as well as with G. Ponish and D. Wirth [51,83], we observed that the principal cause of arrhythmias occurring during the exposure to acceleration consists in rapid changes in the potential within the autonomic nervous system and that, in subsequent trials, even when conducted in the same subjects, the G-force stimulus does not stimulate the system in the same manner. One of the conclusions drawn from these studies is that higher accelerations are tolerated by pilots with hyperactive and intermediate type of parasympathetic nervous system.

An example record of physiological parameters measured to determine the limits of tolerance to acceleration presented in fig. 5 includes the following standard parameters: ECG, respiratory wave, acceleration curve and time of response to visual stimulus appearing within the peripheral visual field. It should be noted that fig. 5 also presents newly introduced physiological measurement parameters such as the temporal artery blood flow rate assessed by Doppler ultrasonography.

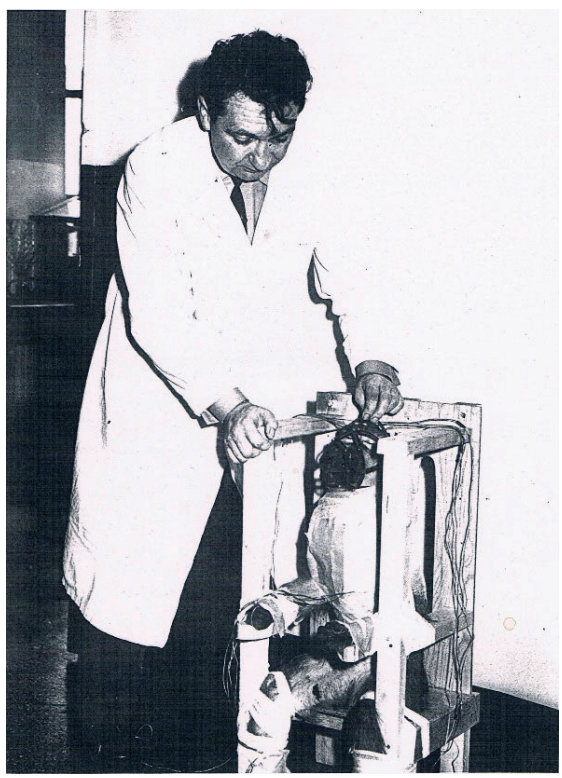

Fig. 4. A Baboon being prepared for examination in the animal centrifuge.

The use of a proprietary Doppler method for the measurement of temporal artery blood flow rates in subjects tested in the human centrifuge [45,48,62] allowed for precise identification of the moment when visual disturbances occurred. The moment of change in the direction of the blood flow is marked on the mean flow rate curve. The time span of the change in the direction of the blood flow measured until the disappearance of momentary flow pulsation indicated the time until the loss of peripheral vision. The moment of disappearance of momentary flow pulsation indicated the acceleration tolerance limit. Also is the phase of centrifuge deceleration when venous flow rapidly returns into the vascular system of the head.

The developed method for the assessment of tolerance to acceleration allowed for full objectivization of hitherto subjective evaluation of results, thus facilitating unquestionable identification of simulating or dissimulating subjects [46]. Due to the long time span between the start of blood outflow within the temporal artery and the loss of peripheral vision, the method increased the safety of centrifuge tests by preventing G-LOC cases. fig. 6 presents the instrumentation and the technique for the Doppler probe used to measure the flow of blood within the temporal artery being mounted on the subject's head [84].

Other studies in this group were related strictly to ophthalmological issues [23,24, 25,36,37,38,44,72]. Principally, they pertained to two important directions of research. The first direction, pursued together with I. Kożuchowska and J. Tajchert, involved isotopic verification of the impact of sudden dislocations of large blood volumes on intraocular pressure and on the permeability of the blood-ocular barrier for blood proteins [25]. The other direction of research, pursued together with I. Kożuchowska and J. Zawitkowski [23,24,72], was aimed at elucidation of the role of intraocular pressure in the development of visual disturbances that always preceded the loss of consciousness in routine trials. The results of these studies partially explained the role of intraocular pressure in the development of visual disturbances while also pointing to the possibility of G-LOC occurring without preceding visual disturbances in pilots with low intra-ocular pressure. Other studies that may be included in this group were biochemical analyses of blood at variable acceleration.

HUMAN CENTRIFUGE STUDIES

The third subject group consists of studies devoted to the development of methodologies of human centrifuge tests for aviation personnel and to the assessment of the results of these tests. As part of this group of studies, and in collaboration with T. Jasiński, I analyzed the relationships between the age and morphotic features of pilots and the limits of tolerance to acceleration [40,54,58,75]. These studies were of considerable epistemic value. Of particular note is the practical applicability of these studies in routine tests of the aviation personnel with the aim of determining the limits of systemic endurance and for medical certification-related purposes. These studies [20,61] facilitated an objective assessment of compensatory reactions within the circulatory system in various in-flight conditions, thus providing a potential basis for routine diagnostic examinations of pilots. Articles on the subject were published in Polish as well as international journals [5,22,30,41,43,59,60,70,77]. In these studies, conducted together with B. Bembnowski, A.P. Kotovskaya, S. Barański, W. Papenfuss and G. Kollande, we described e.g. the human centrifuge tests using three different acceleration programs. The first program, referred to as the linear program, facilitated precise determination of acceleration at which visual disturbances resulting from the reduced pressure within the ocular artery are observed. The second program, referred to as the temporal program, allows for the assessment of the duration of the efficiency of compensatory mechanisms of the circulatory system while the third program, referred to as the interval program, exposes subjects to conditions similar to those experienced during the flight with regard to compensation of rapidly increasing multidirectional accelerations.

Following appropriate verification and determination of grading scales, the developed programs [43,70] were introduced to routine examinations of the aviation personnel. Of particular importance was the development of a visual field meter facilitating the assessment of visual perception within the peripheral field upon the exposure to acceleration (in collaboration with Wołkanowski) [91]. The first visual field meter facilitated the assessment of peripheral perception of light stimuli traveling along the arms at stochastic speeds until the loss of peripheral vision indicative of the limit of tolerance to acceleration. Introduction of the second visual field meter was aimed at determination of the peripheral perception of stationary objects changing their shapes until the loss of curricu-peripheral vision and the lack of response to the shape changes. The aforementioned visual field meters were used in my collaborations with O. Truszczyński and R. Z. Lewkowicz [33,39,70] aimed at the assessment of the effects of acceleration of various characteristics on simple reaction times in pilots.

METHODS OF INCREASING TOLERANCE TO ACCELERATION

The fourth subject group consists of studies [2,26,28,50,65,71,74,86,88] on the applicability of certain forms of physical training for increasing the systemic tolerance to acceleration. This group also includes the studies [13] conducted together with Z. Dziuk and H. Sulajnis regarding the assessment of correlations between the development of selected motor abilities and the tolerance to acceleration.

Together with B. Bembnowski, M. Błaszczakiewicz and H. Aremba [4], I demonstrated that, among the different training devices used to increase the tolerance to in-flight conditions, looping exercises are too burdensome for the cardiovascular system and therefore their intensity should be reduced.

The tolerance of a trained body to acceleration depends to some degree on the motor skills developed during the training, including strength, speed, or speed-endurance [13] which improve the tolerance to acceleration. Exercises aimed at the development of the aforementioned motor skills were included in the physical education curricula of pilot candidates of the Polish Air Force Academy in Dęblin (PAFA) and became a compulsory element of training for pilots undergoing annual trainings a Military Training and Fitness Centers (MTFC). The developed training program consisted of 2 stages. The first stage consisted in isometric training of selected muscle groups along with respiratory exercises and maximum muscle straining [79]. The second stage consisted in conducting of type L1 circorespiratory trials to increase the blood pressure in coordination with muscle straining and increasing acceleration within a centrifuge [47]. These forms of training turned out to be an efficient method for significant enhancement of tolerance to slowly and rapidly increasing acceleration.

The tolerance to acceleration was the major problem at the time of the first space flights, and therefore the training I held together with Jan Marks at MTFC was aimed at increasing this tolerance. Krzysztof Klukowski was responsible for

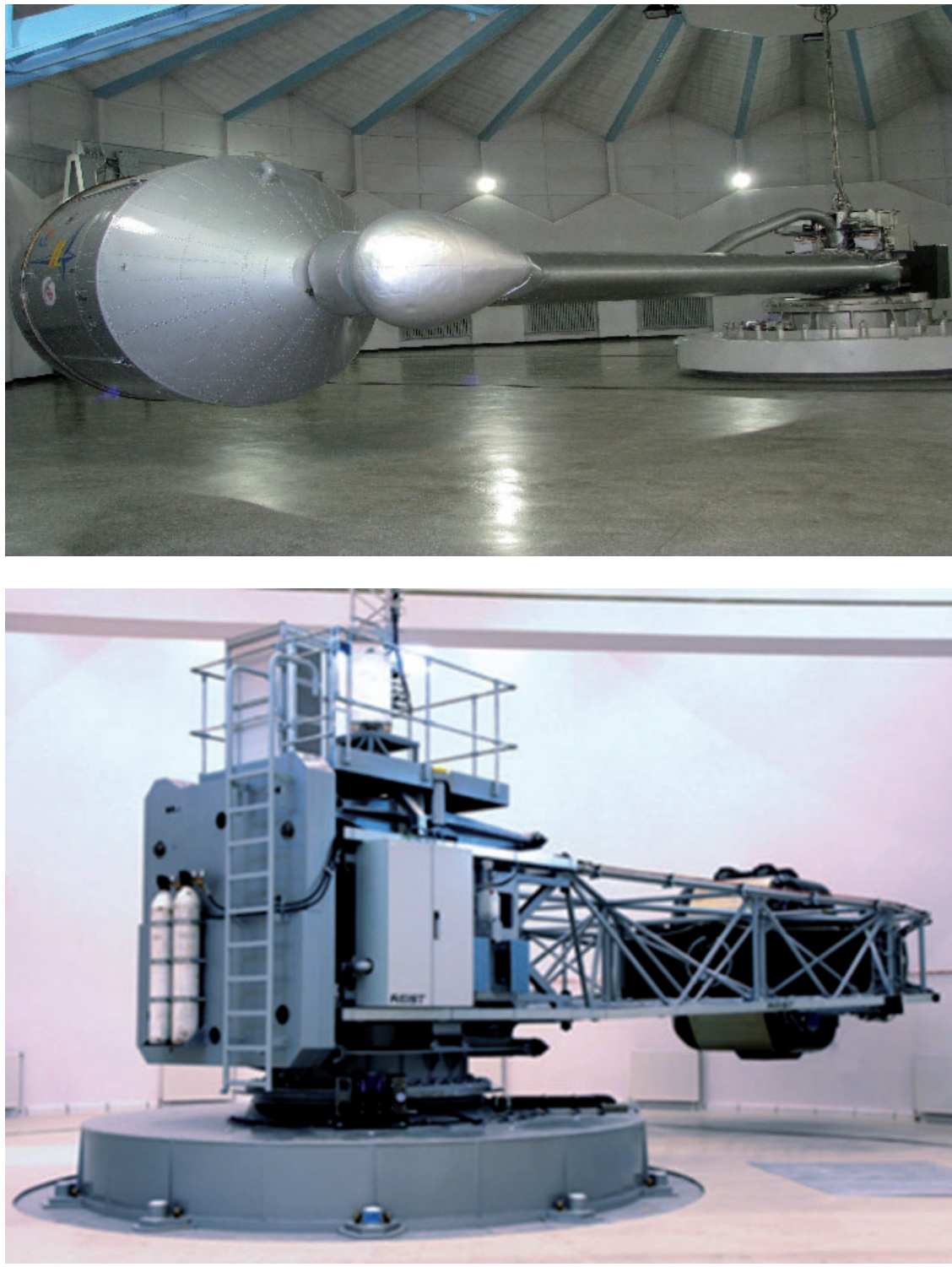

Fig. 5. Old and new centrifuge for people in MIAM.

coordination of the entire specialized training and the program of selection of candidates. The exercise program included individual gymnastic elements verified at PAFA. Following appropriate physiological elaboration of each exercise, the exercise set was introduced into the pilot training curriculum at MTFC. The results of physiological studies carried out at MTFC were published in [55], with the general forms of physical and fitness training described by dr. Jan Marks. Let me also mention that I also took part in the program for the selection of the first Polish cosmonaut [66]

as regarded the assessment of the candidates' tolerance to acceleration. The G-force tolerance tests were conducted in the MIAM's human centrifuge.

The assessment of physical fitness indicators for use in aviation performed together with Z. Jethon, Z. Sarol and Z. Dziuk [19] showed that the Crampton's indicator and Skibinski circo-respiratory indicator were sufficient for determination of adjustment to hypoxic conditions while the Mondurant index was sufficient for determination of G-force compensation. Maximum systemic tolerance to acceleration depends on the age and body structure and is observed in pilots below the age of 38, with lowest values being observed in tall and lean individuals [54]. Studies on the methods of increasing the tolerance to acceleration also included the tests of anti-gravity suits of various designs aimed at protecting individuals from the effects of G-forces [30,49,57,63,64]. In years 2002-2006, as part of my collaborations with W. Papenfuss, G. Kollande, G. Ponish and D. Wirth of the German Air Force Institute of Aviation Medicine in Königsbrück, I studied the effectiveness of LIBELLE hydrostatic anti-G suit. In this period, I conducted periodic health examinations of German pilots, assessing their G-force tolerance limits using a Polish human centrifuge. Similar studies were conducted in collaboration with W. Albery and S. Bolia as part of individual research contract for joint Polish-American studies on the efficacy of various types of anti-gravity apparel [63,64,73].

During the near 60 years of my employment at the MIAM, I gained rich experimental as well as medical experience in examinations of various types of consequences of acceleration and other conditions exerted on living organisms during continuous or periodic exposure of humans and animals in centrifuges. As the result of my scientific works in 1982, by the decision of the Scientific Council of the MIAM and on the basis of my previous research accomplishments and the dissertation entitled Studies of the systemic tolerance to gravity loads as assessed by means of temporal artery blood flow rates and the visual disturbances, I received habilitation in medical sciences. Nine years later, in 1993, I obtained the title of the Professor of Medical Science.

MY OTHER SCIENTIFIC ACTIVITY

Parallel to my research activity mentioned above, I was involved in numerous additional scientific task. In years 1977-78, I was delegated to Iraq, where I worked for a year and a half as an expert and lecturer in aviation medicine. Being an experienced specialist, particularly in the pathophysiology of accelerations, I engaged in consultations and collaborations with researchers from the USSR, German Democratic Republic, Bulgaria, and Czechoslovakia. I systematically broadened my scientific knowledge during numerous international research internships. In the same period, I was appointed by professor H. Bjurstedt (Karolinska Institutet, Department of Environmental Physiology) a corresponding expert of the International Union of Physiological Sciences, Commission on Gravitational Physiology.

Since 1982, I was a member of the Scientific Council of the MIAM in Warsaw. Besides my affiliation at the Institute, I was also an active member of numerous scientific associations. In 1962, I joined the Polish Astronautical Society, where I served as the head of the Bioastronautics Committee, treasurer, secretary general, and vice-president. In 1964, I joined the Polish Physiological Society and in 1989, the Polish Ergonomics Society. Since 1988, I was a member of the International Astronautical Federation and the International Academy of Astronautics as well as the scientific consultant of the Central Institute for Labor Protection. In addition, I was a member of the Commission of Astronautics and Space Technologies at the Committee on Space and Satellite Research of the Polish Academy of Sciences and as well as a member of the Commission of Space Biology and Medicine of this Committee. I was also a member of the State Commission on Aircraft Accidents Investigation.

Since the beginning of my work at the Institute, I conducted trainings to physicians applying for specialization in aviation medicine (lectures and training of physicians studying to obtain the first and second degree specialty in aviation medicine) as well as lectures and simulator trainings for the aviation personnel. I supervised the specialist trainings of about 50 physicians.

I was a reviewer of numerous aviation-related studies and doctoral dissertations. In years 1980-1990, I was a scientific expert involved in consultations concerning certain modifications in the design of pilot's ejection seat. I also assessed prototypes and ergonomic properties of THL helmets. I was the author of technical and medical guidelines for the new human centrifuge which was installed at the MIAM.

I received numerous awards and distinctions for my research and educational achievements, including: in the period of 1962-1990: first-degree prize in the research competition of the Minister of Defense for the study of spinal injuries in pilots

undergoing emergency ejections in 1973, second-degree prize for research on the effect of gravitational loads on the visual system in pilots in 1976, third-degree prize for co-authoring of a handbook titled "Medycyna Lotnicza i Kosmiczna" ("Aviation and Space Medicine") in 1977 and a honorary distinction for the study involving the measurements of blood flow rate in the assessment of systemic tolerance to gravitational loads in 1980.

Moreover, I received four awards of the Commander of Air Force for my research studies and involvement in aviation, eight prizes in research competitions held by the MIAM, as well as the award of the editors of the "Lekarz Wojskowy" ("Military Physician") journal for my study entitled Respiration of isolated liver tissues under gravitational loads of 40-8000G. Furthermore, I received the second prize of the 33rd Convention of Polish Ophthalmologists for my study entitled Pneumotonographic assessments in orthostatic tests conducted in pilots before and after the effects of gravitational load.

For my achievements in research and educational work, I was awarded with:

- Gold Medal of the Armed Forces in the Service of the Fatherland (1973);
- Gold Cross of Merit (1978);
- Knight's Cross of the Order of Polonia Restituta (1985);
- Medal of the Commission of National Education (1988);
- Gold Medal of Merit for National Defense (1986);
- Medal of Merit for National Anti-Aircraft Defense (1987);
- Medal of Merit for Air Forces (1989) as well as other medals.

In addition, I was awarded the Badge for Outstanding Health Service Work and the Honorary Badge of the Polish Red Cross.

I was an active participant of numerous symposia as well as scientific conferences and congresses both in Poland and abroad. My professional achievements include a total of 129 publications in Polish and international journals as well as several textbook chapters. In years 1963 to 1993, I conducted about 15,000 examinations and trainings of pilots using human centrifuges and I was an instructor at about 1,200 ejections performed using land training devices at acceleration of 9-16G.

As a professional soldier, and later as a scientific consultant, I worked for the MIAM until the end of 2015. I wish the MIAM the best of luck in the next 90 years and more, and I would like to thank people who I worked with for our Institute for the last sixty years.

TECHNICAL ASSISTANCE:

Rafał Lewkowicz

AUTHORS' DECLARATION:

Study Design: Mieczysław Wojtkowiak; **Data Collection:** Mieczysław Wojtkowiak; **Manuscript Preparation:** Mieczysław Wojtkowiak. The Author declares that there is no conflict of interest.

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RECOLLECTIONS OF WORK AT THE FLIGHT HYGIENE AND SAFETY DEPARTMENT AT MIAM IN THE YEARS 1972-1998

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Source of support: Own sources

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Abstract: The author, as a pharmacist, presents research and organizational problems of a scientific institute dealing with scientific research and application tests in the field of flight hygiene and safety in the years 1973-1998. He also describes expert activities and procedures for investigating air accidents from this perspective.

Keywords: Pharmacology, occupational health, flight safety, plane crashes from a pharmacologist's perspective

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INTRODUCTION

My first contact with the Military Institute of Aviation Medicine (MIAM) dates back to 1973, when my superior, head of the Department of Toxicology at the Medical Academy in Warsaw, Prof. Władysław Rusiecki commissioned me to perform tests to determine whether the level of carbon monoxide in the pilot's organism can be determined in the section material collected several dozen hours after a crash. The research carried out with the technical assistance of the MIAM Flight Hygiene and Safety Department resulted in a joint publication in the magazine "Medycyna Lotnicza" ("Aviation Medicine"). My participation in these studies was positively evaluated, as a result of which I was offered the position of an Assistant Professor at the Flight Hygiene and Safety Department. In 1974, I started working at the toxicology laboratory of the Flight Hygiene and Safety Department.

THE FLIGHT HYGIENE AND SAFETY DEPARTMENT

The Flight Hygiene and Safety Department (FHSD) had four laboratories dealing with pathomorphology, toxicology, hygiene of flight and technical personnel clothing as well as food hygiene of the above mentioned personnel. The first basic activity of the Department was the research conducted for the Military Committee for Investigation of Aviation Accidents. Pathologists from the Department were directed to the place of the plane crash each time in order to conduct an external and internal medical examination in order to exclude or determine the causes of the crash taking into account the disease changes in the pilot's body and to collect biological material for further examination at the Department. The collected material was delivered to the toxicology laboratory for biochemical and toxicological tests, where I performed tests for presence of alcohol in blood, carbon monoxide in the pilot's organism and carbohydrate profile in selected organs. Protocols from these examinations were sent to the accident investigation committee. The second part of the material was transferred to the pathomorphology laboratory for further histological examination.

RESEARCHES FOR FLIGHT HYGIENE AND SAFETY

Apart from the aforementioned research resulting from aviation emergency situations, the Department conducted research within the framework of the scientific plan of the Military Institute of Aviation Medicine. The research was completed in 1977 with a publication entitled: "Changes in the activity and morphological picture of the endocrine system under conditions of altitude hypoxia, high and low temperatures and combined impact of these factors". They were honored with the first place in the MIAM Commander's contest for scientific papers.

In the following years, research on the influence of hypoxia on the body was continued at the Department. It was appreciated by the Minister of National Defence, who in 1979 awarded the team, which I was a part of, with a second-degree team award in military medicine for experimental and clinical elaboration of effects of hypoxia on the human body.

In 1980, after presentation of the doctoral dissertation entitled "The influence of ethanol and caffeine on tolerance of acute altitude hypoxia" to the Scientific Council of the Pharmaceutical Department of the Medical Academy I obtained a PhD degree in pharmaceutical sciences.

In the years 1978-1990, the Flight Hygiene and Safety Department actively participated in interdisciplinary research conducted by selected research institutes of the Jagiellonian University, the University of Warsaw, the Nicolaus Copernicus University in Toruń, the Military Medical Academy and the University of Physical Education in Gorzów Wielkopolski, within the framework of the governmental programme R III-14 on the influence of biological rhythms on human and animal organisms. The FHSD conducted research on the influence of biological rhythms on the human body in the aspect of work in the air. I have also actively participated in these studies. As a result of this research, in 1985 the Minister of National Defence awarded the following team: prof. Krzysztof Kwarecki, doc. Władysław Święcicki, dr Zbigniew Koter and mgr Krystyna Zużewicz, the first-degree award in military medicine for "A series of studies concerning disturbances of biological rhythms in the aspect of flight safety".

In the years 1979-1980, the toxicology laboratory conducted hygienic and toxicological tests in the cabin of the TS-11 "Iskra" training aircraft and on behalf of the Communication Equipment Factory in Świdnik - hygienic and toxicological tests in the cabins of the "Kania" and "Sokół" helicopters. These tests were necessary to present both helicopters manufactured in Świdnik for approval. For the research entitled "Experimental works concerning new aircraft manufactured in Poland", in 1980 the FHSD received the first prize by the Commander of MIAM in a scientific works contest.

Fig. 1. Team of the Flight Hygiene and Safety Department (FHSD) (from left to right: prof. Władysław Święcicki, prof. Krzysztof Kwarecki, mgr Krystyna Zużewicz i dr Zbigniew Koter).

INTERNATIONAL RESERCHES FOR INTERKOSMOS

In 1978 a cooperation with scientists was established with the Institute of Medical and Biological Issues in Moscow, which resulted in sending to Moscow a team of 3 people led by me, in order to undertake research on animals present in space under conditions of changed gravity on Sputnik 1138. A further part of the tests was carried out at the FHSD. I have presented the results of these studies in 1980 at the International Scientific Congress INTERKOSMOS in Dresden in the form of two scientific reports. A report on the completion of this work, entitled "The cycle of research on the influence of variable gravitational conditions on selected biochemical and physiological reactions" was awarded in 1981 the first prize by the Commander of MIAM in a scientific works contest.

In 1982, the FHSD and the Department of Pathophysiology organized two camps for pilots with high BMI in the "Gronik" and "Mrągowo" fitness centers. The aim was to improve the condition of flying personnel, especially overweight pilots, through appropriate diet profiling and fitness training in order to reduce the body weight. At that time I conducted biochemical research in the name of FHSD, determining lipid profile, insulin level and carbohydrate profile in pilots before and after the camps, during which a properly profiled diet combined with increased physical effort was applied during training in the hall and during training in the mountains. A scientific paper summarizing the above mentioned research entitled "The cycle of research on the state of health of flying and technical personnel" was awarded with a diploma for taking the first place in the competition of scientific works of the Military Institute of Aviation Medicine.

At the beginning of the 1990s, after the personnel changes at the Department and the expiry of the governmental program R III-14 on the influence of biological rhythms on the human body in the aspect of work in the air, the research focused on the influence of hypoxia on the disturbances in the rhythm of daily melatonin secretion in the pineal gland. Some of the research was conducted in cooperation with the Faculty of Biology at the University of Warsaw. This research resulted in several scientific publications in Polish and foreign journals.

In 1998 I left my job at Flight Hygiene and Safety Department at MIAM and started teaching at the Department of Toxicology at the Medical Academy in Warsaw.

AUTHORS' DECLARATION:

Study Design: Zbigniew Koter; **Data Collection:** Zbigniew Koter; **Manuscript Preparation:** Zbigniew Koter. The Author declares that there is no conflict of interest.

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MY 45 YEARS OF WORK AS AN AVIATION LARYNGOLOGIST AT THE MILITARY INSTITUTE OF AVIATION MEDICINE

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Source of support: Own sources

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Abstract: The author, an aeronautical laryngologist who has been working at the Military Institute of Aeronautical Medicine for 45 years, presents a short history of this specialty in the period 1973-2000, in which he worked in the clinical and audiological-labyrinthological part of Military Institute of Aviation Medicine in Warsaw, acting as the Head of the Hearing and Balance Organ Clinic, which was equipped with a "silence chamber" and a unique at that time swivel chair with an electronic starter and a two-channel electronystagmograph, as well as an electronically controlled Toennies swivel chair for the examination of vestibular organs. The discussed research from this period in the field of laryngology concerned: pathophysiology of the balance organ, speech intelligibility under flight conditions and disorders of barofunction of ears and paranasal sinuses. Standards for pure tone audiometry and speech audiometry were among other things developed, which found practical application in routine commission tests. The author includes short biographical notes of many laryngologists working during this period and later at WIML and at the Aviation and Medical Commission.

Keywords: aviation laryngology, assessment methods in Polish aeronautical laryngology, profiles of Polish laryngologists working at Military Institute of Aviation Medicine in Warsaw for the last half a century

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The year 1928 can be considered the beginning of aviation medicine in Poland, when the Center for Aviation-Medical Research was established, and aviation laryngology became an important branch of aviation medicine. It is a field of medicine derived from otolaryngology. It is enriched with knowledge of aviation physiology and deals, among other things, with the impact of the aviation environment on the human organism. Its development could take place in an institution combining clinical activity in the field of otolaryngology, scientific activity in the field of aviation physiology and aero-medical certification. Therefore, the historical development of aviation laryngology could be achieved at the Military Institute of Aviation Medicine (MIAM) because these three fields were represented there from the very beginning.

The Center for Aviation-Medical Research had changed its name several times before and after the war, but it can be considered a precursor of the Military Institute of Aviation Medicine. I will skip the previous years of development of aviation health care while describing its history, and I will refer to the changes that had occurred immediately before I started my work at MIAM in 1973 as well as to the later changes and reorganizations concerning the Otolaryngologic Clinic until 2000 and the Hearing and Balance System Diagnostics Laboratory until 2018. Therefore, in this memoir, I am discussing the years 1973-2000 concerning the clinical and audiological-labyrinthological section, as my duties were connected with both of these structures during this period. I took over the position of the Head of the Hearing and Balance System Laboratory in 1999.

Referring to the establishment of the Military Institute of Aviation Medicine, it is necessary to analyze the processes that took place in aviation medicine in the second half of the fifties. Namely, in 1958, as a result of the merger of aviation certification and medicine with a temporary seat in Warsaw and Otwock, the Institute was established together with the Clinical Center and the Aviation and Medical Commission. It received a common name - Military Institute of Aviation Medicine, and in 1960 moved to a newly built complex of buildings at Krasińskiego 54 street in Warsaw.

In the first half of 1960s, MIAM developed an important scientific and experimental base. The Laboratory of Pathophysiology of the Hearing and Balance System, as it was then called, was equipped with a "silence chamber" and in 1965 with a swivel chair with an electronic starter and a two-channel electronystagmography stem, which was unique at that time. In 1975, a modern, second in Poland, electronically controlled Tönnies swivel chair for examination of vestibular organs was brought to the Laboratory.

Experimental works from this period, implemented for practical application in the field of laryngology, concerned: pathophysiology of the balance organ, speech intelligibility under flight conditions and disorders of barofunction of ears and paranasal sinuses. Standards for pure tone audiometry and speech audiometry were among other things developed, which found practical application in routine commission tests.

At that time the head of the laryngology unit was colonel Stanisław Pawłowski, M.D., Ph.D. and in 1966 lt. col. Stanisław Czech, M.D., Ph.D. took over this position. The head of the laryngology unit from 1957 to 1973 was colonel Henryk Warnowski, M.D., Ph.D.

In 1972 a major reorganization of MIAM took place. The existing center of experimental pathophysiology was reorganized. The scientific laboratories were given the names of the Departments and in the Center of Aviation Pathophysiology clinical departments were transformed into clinics. Since 01.02.1973 the position of the head of the Laryngologic Clinic had been taken over by Associate professor Stanisław Chodynicki, M.D., dr hab. (doctor habilitatus), from the Otolaryngologic Clinic of the Medical Academy in Białystok, who employed me full time in the Clinic on 29.05.1973. Since 01.07.1973, the duties of the head of the clinic were transferred by Associate professor Chodynicki to Janusza Kubiczkowa, M.D., dr hab. (doctor habilitatus)., Associate Professor employed at MIAM in 1972, who later obtained the title of professor.

MEMOIR OF PROFESSOR JANUSZA KUBICZKOWA

Prof. Janusza Kubiczkowa, M.D., dr hab. (doctor habilitatus) was born in 1929 in Lviv. She graduated from the Medical Academy in Wrocław in 1952. In the years 1956-1972 she was employed at the Second Clinic of Laryngology, Physicians Improvement Institute in Bydgoszcz, as a Senior Lecturer. She obtained her M.D., Ph.D. degree in medical science in 1966 on the basis of the thesis entitled: "Vestibular lesions following a single and repeated thermal stimulus". In 1976 she obtained her post-doctoral degree (doctor habilitatus) in otolaryngology on the basis of her dissertation entitled: "Statokinesiometric test in the evaluation of balance". In 1983 she was conferred the title of professor of medical sciences. She is a 2nd de-

gree specialist in the field of otolaryngology and aviation medicine. From 1973 until she retired in 2000 she was employed as the head of the Otolaryngologic Clinic at MIAM. During this period, she also served as the chief laryngologist of the Air Force. She has published 125 scientific papers in Polish and foreign magazines. She is the co-authored five books[1].

Scientific and didactic activity of prof. Janusza Kubiczkowa M.D. mainly concerned research on the physiopathology of the balance system, including, in connection with space flights, research on the role of the labyrinth in triggering motion sickness and its pharmacotherapy, the influence of Coriolis accelerations on the vestibular system, spatial orientation disorders, the influence of hypokinesia on the balance system, hearing organ and sense of taste, the influence of harmful factors on the balance system and the study of balance system functions using galvanic test. Pioneer studies of vestibulo-spinal reflexes using a posturograph, conducted by professor Janusza Kubiczkowa, as one of the first in Poland, with the simultaneous implementation of vestibular tests, allowed for an objective assessment of the balance system for clinical, certification and experimental needs. Posturography in peripheral damage of the balance system was also the subject of studies under the grant of the State Committee for Scientific Research (CSR).

Scientific and didactic activity of the Clinic under the direction of prof. Janusza Kubiczkowa included: pre-examination courses for the 1st and 2nd degree of otolaryngology major, postgraduate courses for civil and military medical doctors in otoneurology and laser surgery, lectures in laryngology centers, active participation in Congresses, national and international symposia, including: Meetings of the Otolaryngological Society, Scientific and Training Conferences, "Intercosmos" Symposia, Meetings of the Society of Posturography, Astronautical Meetings. Prof. Janusza Kubiczkowa, M.D., is a member of the International Society of Posturography and an honorary member of the Polish Society of Otolaryngologists – Head and Neck Surgeons. In 1984, the Clinic organized the 6th National Scientific and Training Conference for Laryngologists of the Polish Army at MIAM.

Prof. Janusza Kubiczkowa, M.D., dr hab. (doctor habilitatus) was the supervisor of 6 Ph.D. dissertations. Clinical interests included surgical treatment of patients, among others, with head and neck cancers (total and partial laryngectomies), Crile's neck dissection, facial nerve decompression in otogenous paresis and parotid tumors, kofosurgery and laser surgery.

In 1980, the MIAM Otolaryngological Clinic was one of the first in Poland to use the CO_2 laser and jet ventilation for the treatment of inflammatory and post-traumatic lesions, especially for the treatment of neoplastic lesions in the larynx, nose, oral cavity and laryngeal papillomatosis. Equipping the clinic with modern equipment: laryngeal microsurgery kit, CO_2 laser, an ear surgery microscope, endoscopy kit, allowed to perform a wide range of otolaryngological surgeries.

When the Clinic was headed by prof. Janusza Kubiczkowa, the following military and civilian physicians were members of the team during various periods: at the Otolaryngologic Clinic - Stanisław Czech, Zbigniew Baczyński, Zbigniew Kaczorowski, Marian Pawlik, Piotr Kapitan, Bohdan Dobrowolski, Wiesława Gerwatowska, Roman Stablewski, Jan Adam Jaskowski, Piotr Rozlau, and in the Laboratory of Pathophysiology of the Hearing and Balance System: Leszek Zaleski and Jan Nowicki (later professor), Jadwiga Wierciszewska, M.D. The volunteers specializing in otolaryngology, working at the Clinic, were: Wojciech Dębiński, Andrzej Zakrzewski, Andrzej Wolniak and Paweł Różycki. The otolaryngology specialty was acquired at that time by Mirosława Landowska, M.D., who was also a pilot at LOT Polish Airlines.

I owe my professional development to a large extent to professor Janusza Kubiczkowa and the 27-year period of our cooperation, for which I would like to thank her very sincerely in this memoir.

MEMOIR OF PROFESSOR JAN NOWICKI

The second professor who received this honorable title at MIAM is colonel prof. Jan Nowicki. He received his medical doctor's diploma at the Medical Academy in Gdańsk in 1950. A 2nd degree specialist in aviation medicine, otolaryngology and audiology. In the years 1959-1972 he was the Senior Lecturer in the Laboratory of Pathophysiology of the Hearing and Balance System, and in the years 1973-1994 he was the head of this laboratory, at that time known as the Hearing and Balance System Diagnostics Laboratory. Since 1984 he has been employed as the associate professor. He obtained his Ph.D. degree in 1967 on the basis of his dissertation: "Masking in speech audiometry through bone conduction", and in 1976

1 "Aviation and Space Medicine", "Clinical Otoneurology" ed. 1, "Injuries in otolaryngology", "Specialist treatment of head injuries", "Clinical Otoneurology" ed. 2.

he obtained the post-doctoral degree (doctor habilitatus) on the basis of the dissertation entitled: "The influence of aviation noise on binaural auditory integration in the light of a self-defined method of examination with distorted speech". In 1988 he was conferred the title of professor. He has published about 100 scientific papers (monographs, studies and articles). He is the co-author of the textbook "Basics of aviation medicine". He has carried out 18 scientific assessments. Supervisor of one Ph.D. dissertation. Scientific interests of colonel professor Jan Nowicki concerned audiology and labyrinthology, which resulted in the development of new methods of audiological and labyrinthological tests, the development of a method for testing binaural auditory integration, the determination of practical applicability of threshold tests and speech audiometry in audiological diagnostics, the development of individual and general principles of noise prevention in aviation. The author of this study actively cooperated with prof. Nowicki within the scope of these works. Colonel. prof. Jan Nowicki, M.D., officially retired in 1991 and continued his scientific work at the Institute until 2005 as a civil employee of MIAM, professor - scientific consultant of the Military Institute of Aviation Medicine. He died on 05.02.2014.

I gained a lot of experience in the field of scientific work during the period of 32 years of cooperation with professor Jan Nowicki. He was an advocate of promoting me to become doctor habilitatus. I will repeat the last sentence from my farewell to the professor during his funeral in February 2014: "We say goodbye to you, professor, and we promise you that you will always remain in our memory".

Returning to the issues related to the Otolaryngologic Clinic, it is worth mentioning the subsequent heads of the units, who additionally performed the function of the Deputy Head of the Clinic. In the following years these were: colonel Stanisław Czech, M.D., dr hab. (doctor habilitatus) (in the years 1973-1979), lt. col. Zbigniew Baczyński, M.D., Ph.D. (in the years 1979-1985) and colonel Zbigniew Kaczorowski, M.D., Ph.D. (in the years 1985-1999).

MEMOIR OF OTHER AVIATION LARYNGOLOGISTS

Among the long-term employees of the MIAM Otolaryngologic Clinic, the following people should be mentioned:

Colonel Leszek Zaleski, M.D., Ph.D.

Obtained the medical doctor's diploma in 1939 and in the same year was appointed to professional military service, serving as a military physician. After moving to reserve in 1947, he specialized in the field of laryngology in Warsaw. In 1952, he was again called for the professional military service, initially as the head of the hospital laryngology unit and then the head of the laboratory of the Central Institute of Aviation and Medical Research. During this period, he was also the chief laryngologist of the Air Force. He was a specialist in otolaryngology and aviation medicine and in 1962 obtained the degree of the Doctor of medical science on the basis of his dissertation entitled: "The use of speech audiometry in aviation". Author of 20 scientific papers, mainly in the field of audiology and otoneurology. He moved to the reserve in 1973. He died in 1997.

Colonel Stanisław Czech, M.D., dr hab.

Received his medical doctor's diploma at the Medical Academy in Lublin in 1953. After two years of work in the Otolaryngological Clinic in Lublin, he was called for professional military service in the aviation unit in Świdwin. After acquiring the first degree specialty in laryngology, he was transferred to the Aviation Hospital in Otwock as a senior assistant, and in 1960 he was appointed the senior assistant at MIAM. He was the second degree specialist in laryngology and aviation medicine. In 1967, he was conferred the PhD degree after defending his dissertation entitled: "Modification of the research on the ability to balance the intra-auricular pressure in the low pressure chamber for the assessment and selection of candidates for pilot schools on the basis of own material". From 1973 to 1979, he was the head of unit and the Deputy Head of MIAM Otolaryngologic Clinic and later the head of the Laryngology Unit at the Main Military Aviation and Medical Commission (MAMC) In 1987, he was awarded the post-PhD degree (doctor habilitatus) on the basis of the dissertation entitled: "Value of impedance audiometry for clinical aviation medicine", under the scientific supervision of prof. Janusza Kubiczkowa. He published 35 scientific papers and was working in the field of aviation and space medicine, audiology and aviation-medical certification. He moved to the reserve in 1994 and died on 12.08.1996.

Lt. col. Zbigniew Baczyński, M.D., Ph.D.

Received his medical doctor's diploma at the Medical Academy in Warsaw in 1952. Recruited

to the army, he served as a physician in the Air Force Communications Regiment in Nowy Dwór Mazowiecki and in the Artillery Regiment of the National Air Defense Forces in Warsaw. In 1969-1971, he was delegated to the Otolaryngologic Clinic at the IKP WAM, where he acquired the first degree specialty in laryngology. In 1972, after acquiring the second degree specialty in the field of laryngology and aviation medicine, he took up the position of the Senior Assistant and then of the Senior Lecturer at the Laryngologic Clinic at MIAM. In 1978, he defended his Ph.D. dissertation entitled: "Electronystagmography of vestibular functions in parasitic diseases of the digestive tract" under the supervision of prof. Janusza Kubiczkowa. In the same year he became the head of the Otolaryngologic Clinic. He published 8 scientific papers. He moved to the reserve in 1985 and was appointed the Head of the Laryngological Unit of the hospital in Ciechanów. He retired in 1994. He has been dead for 2 years.

Colonel Zbigniew Kaczorowski, M.D., Ph.D.

Dear Reader, please forgive me a more casual and more detailed presentation of my own biography below.

I have been working at the Military Institute of Aviation Medicine for over 45 years. I was born in Radzyń Podlaski on 21.07.1941 in a two-store tenement family house with a direct view on a beautiful Baroque park and palace complex of the Potocki family. I don't know to what extent this influenced the fact that my wife Teresa is a gardener, Eng. and our older daughter Agnieszka is an art historian. I know, however, that I had an influence on my younger daughter Małgorzata, who partly followed in the footsteps of her father and family traditions and became a radiologist. Since 1945, I have been associated with Warsaw, specifically with Grochów in the area of Szembek Square. I received my first education at Primary School No. 54 at Kordeckiego Street, behind which there was a huge field of wasteland, covered with bomb craters from the war period with concrete shelters, where in 1964 the 2nd Central Clinical Hospital of the Military Medical Academy and the surrounding housing estates were built.. Then I graduated, in the years 1960-1966, I studied at the 3rd Course of the Faculty of Medicine of the Military Medical Academy in Łódź, which I recall with fondness. I received my medical doctor's diploma in 1966. After 2-year post-graduate internship at IKP WAM (renamed from 2 CSK WAM) and 3 years of work as a senior physician of the Sick Ward, the Deputy Head of Health Service of the 3rd Division of the Air Defense Forces of the Country I received the 1st degree of specialization in the field of otolaryngology.

After acquiring the specialty, on 29.05.1973, I was transferred to the position of the Senior Lecturer, approved in 1976, to the Otolaryngologic Clinic of the Military Institute of Aviation Medicine. I completed my qualifications by acquiring two levels of specialty in aviation medicine and the second degree specialty in otolaryngology. I obtained the degree of the doctor of medical science in 1980 on the basis of my dissertation entitled: "The lesions of the vestibular organ and vegetative system following the cumulative effect of Coriolis accelerations", under the kind patronage of professor Janusza Kubiczkowa. From 1985 to 1999 I was the head of the unit and the Deputy Head of the Otolaryngologic Clinic at MIAM. In the years 1997-1999, I was employed as the Head of the Department. On 26.04.1999, being a Colonel, I retired and took the position of head of the MIAM Hearing and Balance System Diagnostics Laboratory, which I have been holding until now.

For my scientific work at MIAM, I have received the following awards: Distinction - 1981 and annual MIAM awards: 1st place in 1981, 3rd place in 1983, 1984 and 1989.

I attended foreign training courses and scientific symposia.

I actively participated in many national and international scientific conferences in the field of otolaryngology, otoneurology, audiology and aviation medicine. In the years 1991-1999 and 2004-2007, I was a member of the Scientific Council of the Military Institute of Aviation Medicine.

I have published 44 scientific and research papers. My scientific interests include: research on labyrinth physiopathology, aviation and space medicine with particular emphasis on spatial disorientation and air sickness, objective, digital evaluation of the balance system, clinical audiology and laryngology.

Since 1994 I have been authorized to issue medical certificates as part of preventive tests in occupational medicine and since 2000 to issue medical certificates for drivers (including motor vehicle drivers), as well as to examine people possessing gun or applying for a shot-gun license. In the years 2001-2005 I was a member of the Medical Council of the Military Medical Chamber (MMC) and for the past four 4-year long tenures I have been elected a judge of the MMC Medical Court. I have been an expert in otolaryngology at the District Court and Regional Courts in Warsaw for three years. During my professional work, two events occurred that I view very critically. The first one was the liquidation of the Military Medical Academy in its previous form, as it ex-

cellently trained the medical personnel within the scope of the specific tasks faced by military medical doctors. The second event, of a nationwide scale, was the introduction in the last two decades of commercialization of health care in its existing form, which resulted in a significant deterioration of the patient-physician relationship, as well as the relations between the physicians. It has also extremely hindered organizational, scientific and therapeutic work of the heads of health care institutions at various levels, concentrating it on the struggle for the survival of institutions. In my opinion, health care has also become very expensive through excessive computerization and the development of unnecessary administrative structures.

Colonel Roman Stablewski, M.D., Ph.D.

Received his medical doctor's diploma at the Military Medical Academy in Łódź in 1975. After completing a postgraduate internship at MIAM in years 1976-1979, he was an aviation physician of the 26th Communication Air Force Squadron in Warsaw. In 1979, he was delegated to MIAM. Since 1981 he had been employed as an assistant at the MIAM Otolaryngologic Clinic. Since 1999 he had been the Clinic Research Associate, as well as a second degree specialist in otolaryngology, aviation medicine and audiology. In 1999, he obtained the degree of the Doctor of medical science on the basis of his dissertation entitled: "Research on the influence of simulated high-altitude hypoxia and changes in atmospheric pressure on the balance control and barofunction of the hearing system and sinuses" prepared under the supervision of prof. Janusza Kubiczkowa. He has published 15 scientific papers. The subject of scientific interest is clinical and experimental pathophysiology of the balance system and hearing organ under changing conditions of barometric pressure and hypoxia. Clinical interests include issues related to diagnostics (endoscopy) and treatments to improve the barofunction of ears and sinuses, laser surgery and problems related to acoustic injury. From 2000 to 28.10.2014, he was the Head of the Clinic. Since 28.10.2014, the Head of the Clinic became prof. Andrzej Wojdas, M.D., former longtime employee of the Otolaryngologic Clinic of the Military Medical Institute at Szaserów Street.

Colonel Marian Pawlik, M.D., Ph.D.

Received his medical doctor's diploma at the Military Medical Academy in 1965. After a medical internship he had been working as a senior regiment physician in Dęblin until 1978. In 1973, he was employed as a senior assistant of the MIAM Otolaryngologic Clinic and in the years 1982-1994 he had been working as the Senior Lecturer. He is the second degree specialist in otolaryngology, aviation medicine and phoniatrics. In 1986, he obtained the degree of the Doctor of medical science on the basis of his dissertation entitled: "Study of the hearing ability of pilots in circadian rhythm" under the supervision of prof. J. Nowicki. After an internship abroad in Paris in 1995, he was certified as an aviation medicine specialist in France. From 1995 to 1999, he was a deputy chairman of the Laryngology Unit at the Main Military Aviation and Medical Commission (MAMC). After his retirement in 1999, he was the chairman of the Aviation and Medical Commission and subsequently he became the chairman of the MIAM Center for Aviation Medicine for Civil Aviation Personnel. He passed away in 2015.

Lt. col. Piotr Kapitan, M.D.

Received his medical doctor's diploma at the Military Medical Academy in 1965. After a medical internship he had been working as a senior aviation regiment physician in Mińsk Mazowiecki until 1973. In 1973 he was employed as the Senior Lecturer, the head of the Documentation and Medical Publishing Department at WIML, and subsequently, in the years 1989-94, he was a senior assistant at the MIAM Otolaryngologic Clinic. He is the first degree specialist in otolaryngology and the second degree specialist in aviation medicine. In the years 1994-1999, he was a senior specialist of the Central Military Medical Commission. He retired in 2000 and now serves as a member of the Aviation and Medical Commission.

Colonel Bohdan Dobrowolski, M.D., Ph.D.

Received his medical doctor's diploma at the Medical Academy in Warsaw in 1966 and was appointed to serve periodically as a physician in the Engineer Military Regiment in Dęblin. After his transition to the professional military service, he was employed in the military institute of the Medical Academy in Warsaw. In the years 1974-1981, he was employed as a senior assistant in the MIAM Otolaryngologic Clinic. In 1979, he obtained the degree of the Doctor of medical science on the basis of the dissertation entitled: "Influence of normobaric hyperoxia on the mucous membrane of trachea" conducted under the supervision of prof. Janusza Kubiczkowa. At the beginning of the 1980s, he left for the The Ministry of Internal Affairs and Administration. Hospital and then for ambulatory work in the Specialist Clinic. He has been dead for several years.

Fig. 1. Medical personnel of the MIAM Otolaryngologic Clinic in 1996. (from the right, sitting: Wiesława Gerwatowska, M.D., Ph.D., prof. Janusza Kubiczkowa, M.D., colonel Zbigniew Kaczorowski, M.D., Ph.D.; from the right, standing: lt. col. Adam Jaskowski, M.D., lt. col. Roman Stablewski, M.D., Captain Piotr Rozlau, M.D.).

Colonel Jan Adam Jaskowski, M.D.

Received his medical doctor's diploma at the Military Medical Academy in 1977 and was sent to work as a physician in the Helicopter Aviation Regiment in Inowrocław. In 1981, he was employed in the MIAM Otolaryngologic Clinic as an assistant and in 1989 as the Senior Lecturer. He is the author or co-author of 22 scientific papers. He left the clinic in 1996 to become a senior specialist, head of the Central Military Medical Commission (CMMC) Laryngological Department. In 1998, he became the Deputy Chairman and in 2002 the CMMC of the Air Force. In 2012, he became the Deputy Head of the Research Center for the Aero-Medical Certification and since June 2018 - the Head of the Center.

Wiesława Gerwatowska, M.D., Ph.D.

Received her medical doctor's diploma at the Medical Academy in Łódź in 1972. After a postgraduate internship in the years1973-1984, she was working as a senior assistant at the Otolaryngologic Clinic of Military Medical Academy in Łódź. In 1984, she was employed as a senior assistant and then the Senior Lecturer at the MIAM Otolaryngologic Clinic. She is the second degree specialist in otolaryngology. In 1981, she received her Ph.D. degree on the basis of her dissertation entitled: "Behavior of certain immune responses in the course of malignant neoplasms of the larynx, lip and jaw" under the supervision of prof. K. Najwer. Since 1991, she has been working as the senior assistant of the Department of Laryngology of the MIAM Polyclinic.

Major Piotr Rozlau, M.D.

Received his medical doctor's diploma at the Military Medical Academy in 1990. After a postgraduate internship, he had been working as a senior missile defense regiment physician in Mrzeżyn until 1995. In 1995, he was employed as an assistant in the MIAM Otolaryngologic Clinic. He is the first degree specialist in otolaryngology, aviation medicine and audiology. Since 2001, he has been employed as the Senior Lecturer in the Department of Laryngology of the Aviation and Medical Commission. He also works as an examiner at the MIAM Center for Aviation Medicine.

STRUCTURAL AND STAFF CHANGES IN THE 1990S

At the end of the 1990s, after the completion of the first stage of the three-year renovation of the hospital premises, staff and structural changes took place. In the Otolaryngologic Clinic, apart

from lt. col. Roman Stablewski, M.D., Ph.D. serving as the head of the Clinic, the following were employed as senior assistants: captain Michał Michalik, M.D. and captain Dariusz Kalinowski, M.D., the second degree specialists in otolaryngology and aviation medicine. Since 2001, second lieutenant Marcin Broda, M.D. specializing according to the new program in otolaryngology, delegated from the alternate position at the Air Force and Air Defence was employed at the clinic, as well as captain Krzysztof Cecherz, M.D..

Zbigniew Kaczorowski, M.D., Ph.D. took over the position of the head of the Hearing and Balance System Diagnostics Laboratory in 1999, Wiesława Gerwatowska, M.D., Ph.D. became the senior assistant in the Department of Laryngology of the Polyclinic and captain Piotr Rozlau, M.D. took over the position of the senior assistant in the Department of Laryngology in the Aviation and Medical Commission.

In addition to the organizational structure of the Otolaryngologic Clinic, there were also the following laryngologists: colonel Marian Pawlik, M.D., Ph.D., lt. col. Adam Jaskowski, M.D. and lt. col. Wojciech Dębiński, M.D. taking up executive positions within the Main Military Aviation and Medical Commission (MAMC), as well as lt. col. Piotr Kapitan, M.D. - an employee of MAMC, lt. col. Wiesław Kluch, M.D. took over the position of the head of the Spatial Orientation Laboratory for several years.

The function of the ward nurse, initially of the combined Laryngological and Ophthalmology Departments and then from 1972 the Laryngological Clinic was held by: Romana Adamiak in years 1960-1975, Aleksandra Winiarska in years 1975-1991, Bożena Jedynak in the 1990s and subsequently Barbara Bomblicka and Małgorzata Rojek-Romanowska. Currently, since 01.06.2015, the function of the ward nurse is held by Anna Szczepańska.

In the years 1953-1960 in Otwock and 1960-1991 at MIAM, the position of the Head of the Operating Block was held by nurse Apolonia Paszkowska and subsequently, for about fifteen years, by Weronika Wojewódzka, who died in June this year. Then, for several years, the function was taken over by Danuta Stachowska and from 2015 by Żaneta Szychowska. The function of the nurse of the operating block was also held by Elżbieta Sokołowska and Anna Kościńska in different periods of time.

The function of a senior technician at the Laboratory of Pathophysiology of Hearing and, since 1973, the Laboratory of Pathophysiology of the Hearing and Balance System was performed by Danuta Cholewka until 1974, then, from 1975 to May 2016, by Anna Krziskowska, who showed an extraordinary commitment during the 41 years of work at this position, for which, as a long-time colleague, I would like to thank her very warmly in this memoir. After Anna Krziskowska's departure, senior nurse Bożena Bomblis, has taken over the function and has been working until now.

Scientific interests of the team, concerning aviation medicine in the discussed years, included the following issues: impact of working conditions of flying and technical personnel on the hearing and balance organ, prevention and treatment of occupational perceptual hearing damage, determination of hazardous zones at workstations of particular airplane types, determination of aviation noise characteristics for different types of airplanes and technical equipment, barofunctional disorders of ears and sinuses.

Apart from the preventive and surgical treatment, discussed during the description of prof. Janusza Kubiczkowa's activity, the following courses were organized in the clinic: training courses in aviation laryngology; pre-examination courses for the first and second degree specialties in otolaryngology; postgraduate courses in otoneurology and laser surgery; postgraduate courses for physicians applying for preventive tests authorizations; for physicians applying for authorization to examine candidates for drivers and for physicians applying for authorization to examine people possessing gun or applying for a shot-gun license.

The clinic's medical team actively participated in national otolaryngologist conventions, scientific and training conferences of military laryngologists, NATO / HFM / RTO symposia.

Equipping the clinic in the 1990s with a functional nose and sinus endoscopy kit created new possibilities of diagnostics and treatment of upper respiratory tract lesions leading to barofunctional disorders.

In the years 1970-2008, 6 otolaryngologists were awarded the academic Ph.D. degree, 3 - post-doctoral degrees and 2 were conferred a title of Professor at MIAM. The second degree specialty in otolaryngology was obtained by 8 physicians and the first degree specialty- by 5 physicians, 2 physicians obtained the specialty in audiology and 1 in phoniatrics. The full-time physicians had a specialty in aviation medicine.

At the end of the first decade and at the beginning of the second one, after the year 2000, they following physicians left the Clinic: Michał Michalik, Dariusz Kalinowski, Marcin Broda and Krzysztof Cecherz and the physicians employed

in their place after 2010 were: Katarzyna Kacperek-Walewska, Elżbieta Zgnilec, Rafał Chmielewski and Paulina Zielińska. The function of the head of the Clinic was still held until 28.10.2014 by colonel Roman Stablewski, M.D., Ph.D. Since 28.10.2014, the position of the Head of the MIAM Otolaryngologic Clinic was taken over by colonel Andrzej Wojdas, M.D., dr hab. (doctor habilitatus), professor of MIAM.

In the Hearing and Balance System Diagnostics Laboratory, the following tasks have been and are currently being carried out:

1. Performing audiological and electronystagmographic tests for the purposes of aviation and medical certification and the clinic's needs.
2. Conducting scientific research in the field of aviation and clinical laryngology.
3. Implementation of preventive tasks counteracting the impact of harmful working environment conditions on the pilot's organism.

Since 1968, otoneurological diagnostics of patients with dizziness has already been practiced in the Laboratory. It was initiated by prof. Jan Nowicki, who simultaneously with prof. Zbigniew Bochenek, performed the first in Poland labyrinthological tests with the use of Toennies electronic equipment. In 1973, I joined these works and, under the scientific direction of prof. Kubiczkowa and prof. Nowicki, we developed our own methodology of tests, consistent with the generally binding world standards.

From the historical point of view, the laboratory has always had a unique equipment, especially for otoneurological tests, due to the need to perform balance system tests in aviation personnel and their importance for flight safety. Since 1965, the laboratory has had the following equipment to examine the balance system:

- 1965 - a swivel chair with an electronic starter and a two-channel electronystagmography stem;
- 1973 - a posturography machine - plate with a stimulator and printer (produced according to the design of MIAM engineers);
- 1975 - an ENG device with Toennies electronic swivel chair;
- 1980 - a device based on TV Libra Unitra WZT for the study of visual tests according to own methodology and design (a computer program for triggering visual stimuli for the visual and photic driving tests andoptokinetic tests using a black-and-white checkerboard);
- 1990 - a Jaeger electrostagmograph with swivel chair + TENA computer program with thermostat for calorific tests by Atmos;
- 1995 - a Jaeger-Toennies posturography machine - dynamic system with TOBIOS program and T-POST + biofeedback;
- 1998 - a VNG MK III Ulmer Videonystagmograph with RONEST swivel chair and Enthermo calorimeter;
- 2009 - an ENG / VNG System 2000 device by Micromedical Technologies, Inc. with automatic test interpretation with a swivel chair and Aqua Star calorimeter. Last year, the Aqua Star calorimeter was replaced by Varioterm Plus made by Atmos. In the near future we are also planning to purchase a new ENG/VNG device;
- Since 1960, the Audiometric Laboratory has been using the audiometers of Polish production. The first high-class clinical audiometer produced by Peters AP-6 was brought to the Laboratory in 1974. Then, in intervals of about 10 years, the audiometers were replaced with the best ones on the market. Since 2014, we have been using the Interacoustic AC-4 clinical audiometer and since 2006 the Zodiak 901 impedance audiometer.

Since 1999, the Laboratory has been managed by colonel Zbigniew Kaczorowski, retired, M.D., Ph.D. After the departure of senior technician Anna Krziskowska, since May 2016, the senior nurse Bożena Bomblis, M.Sc., who is very involved in the tasks facing the Laboratory, has been employed.

In connection with the planned transfer of the Laboratory to new premises, next to the Otolaryngologic Clinic, a number of investments in medical equipment was made or planned, partially replacing the already existing equipment, as well as in new equipment increasing the diagnostic capabilities of the Laboratory. This year a new audiometric cabin was purchased. The impedance audiometer is currently being replaced by the Otometrics Madsen Zodiak impedance audiometer. We have also been fitted with otoemission and auditory evoked potential testing instruments (ABR) by Otometrics. Thanks to these devices we are expanding the methodology of hearing organ examination and diagnostic capabilities of the peripheral and central parts of the vestibular system. Excellent diagnostic equipment also gives us the possibility to provide services for hospitalized and ambulatory patients under the contracts signed with the National Health Fund and to conduct the WSOSP qualification tests every 6 months. A very important task of the Laboratory is also performance of occasional audiological and labyrinthological tests of the flying personnel. The laboratory is an integral part of the Otolaryngologic Clinic and is subordinate to the Head of the Clinic.

At this point, at the end of my memoir, I wish the new Head of the MIAM Otolaryngologic Clinic, professor Andrzej Wojdas and my long-time colleague and sincere friend - the Deputy Head of the Clinic, Roman Stablewski, M.D., Ph.D., good luck in their positions. I also wish you to further develop the Clinic in cooperation with the Clinic Team, relying on new diagnostic possibilities and new operating techniques, for the benefit of aviation personnel and other patients treated at the Clinic. I am glad that it is you who will create the further history of Otolaryngology, Audiology and Aviation Otoneurology at the Military Institute of Aviation Medicine.

AUTHORS' DECLARATION:

Study Design: Zbigniew Kaczorowski; **Data Collection:** Zbigniew Kaczorowski; **Manuscript Preparation:** Zbigniew Kaczorowski. The Author declares that there is no conflict of interest.

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RECOLLECTION OF AVIATION PSYCHOLOGISTS FROM THE PERSPECTIVE OF THE JUBILEE OF THE 90TH ANNIVERSARY OF THE MILITARY INSTITUTE OF AVIATION MEDICINE IN WARSAW

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Abstract: The work has a historiographical nature, documenting the biography of aviation psychologists working for Polish aviation in the years 1928-2018. At the same time, the authors document the institutional activity of aviation psychology on the occasion of the jubilee of the 90th anniversary of the Military Institute of Aviation Medicine in Warsaw and its institutional predecessors.

Keywords: aviation psychologists, historiography, 90th anniversary of the Military Institute of Aviation Medicine in Warsaw, biographies of Polish aviation psychologists

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INTRODUCTION

The work has a historiographical nature, documenting the biography of aviation psychologists working for Polish aviation in the years 1928-2018. At the same time, the authors document the institutional activity of aviation medicine and psychology on the occasion of the jubilee of the 90th anniversary of the Military Institute of Aviation Medicine (MIAM) in Warsaw and its institutional predecessors.

Established in January 1928 by Marshal Józef Piłsudski, the Center for Medical Research in Aviation (CMRA) was to conduct preliminary, periodic, occasional examinations, scientific and research works in the field of flight physiology, aviator health prophylaxis, training of doctors for military and civilian flying personnel, as well as the selection and elimination in the field of psychophysical predispositions to perform the profession of a pilot. The CMRA has started its work within the premises of the Ujazdowski Hospital. It was not until December 1928 that it moved to the building at Rakowiecka str. 2/4 in Warsaw.

PRECURSORS OF MIAM AVIATION PSYCHOLOGISTS

The establishment of the Center for Medical Research in Aviation (CMRA) coincided with the growing interest in the problems of aviation psychology as one of the subdisciplines of occupational psychology in the global aviation. Many countries have developed methods for measuring response times and emotional resilience. Since the World War I to 1926, there were 20 centers in the world dealing with psychological examinations of pilots. On the basis of these experiences, in May 1928, the Psychotechnical Laboratory was opened at Okęcie, subordinate to CRMA. The manager was a physiologist mjr dr Włodzimierz Missurio, who, together with dr Bohdan Zawadzki - a psychologist, edited a paper entitled "Psychotechnika w lotnictwie" ("Psychotechnical research in aviation"), which presented the genesis and tasks for the work of psychologists, as well as a review of psychotechnical research in aviation [9]. In the following years the psychologists of the Psychotechnical Laboratory, a holder of PhD in philosophy Piotr Macewicz, a medical practitioner captain Stefan Knappe, improved the works for the benefit of aviation judicial practice and conducted scientific research. In psychotechnical research, the suitability for the profession of a pilot was determined on the basis of the speed and accuracy of the assessment of an object in motion, the speed of response to visual and auditory stimuli, intelligence and resistance to emotional stimuli. In 1938 -1939, mgr Elżbieta Dębicka together with dr S. Knappe developed a series of tests for psychological examinations of groups of pilots. This series was called "Knapp". They are worth mentioning here, as most of these tests were still used in aviation psychology in the late 1960s. These tests include, among others: "Area" - for the examination of visual memory; "Report"- for the examination of auditory memory and spatial imagination; "Scale" - for the examination of spatial orientation; "Drawing rotation" - for the examination of spatial imagination; "Airplanes" - for the examination of the multitasking; "Horizons" - for the examination of perceptiveness. The results of individual tests were standardized. It is also worth mentioning that apart from psychological research in the Laboratory, psychologists also participated in the so-called field research, during the glider or aviation training. In 1937, dr Stefan Knappe published a paper in which he described the methods of psychological selection of candidates for glider flights [3].

On August 1, 1936, the Center for Medical Research in Aviation was renamed the Institute for Medical Research in Aviation (IMRA). The outbreak of the Second World War interrupted the Institute's activity. On the night of September 4 to 5, 1939, the Institute's personnel was ordered to evacuate to Lviv with their families. Here, the Institute was dissolved and the personnel put at the disposal of the Head of Health Service of VI Corps District Command. The Polish health service in aviation in the West started its activity in France. After the capitulation of France, Polish specialists in medicine and aviation psychology moved to Great Britain. In Great Britain, the Polish health service in aviation operated since July 1940 as the Inspectorate Section of the Polish Air Force and was subordinate to the health service of the RAF. Since August 1942, the Aviation and Medical Scientific Council was operating at the Inspectorate of the Polish Air Force. The works of the aviation physicians were published in the "Journal of The Polish Army Medical Corps: Organ of The Polish Military Medical Society". After the war, some of the medical staff returned to Poland, some remained in exile, such as prof. Bohdan Zawadzki, who came to Poland only in 1968 from the USA, where he was a professor at the City College of New York. Here he gave and published a series of 30 lectures on the achievements of American psychology, including clinical psychology. Bohdan Zawadzki

Fig. 1. The Laboratory of Physiology and Aviation Hygiene with Hospital in Otwock.

later supported psychologists in Warsaw with psychological tests and offered them his library. He invited young psychologists to take advantage of scholarships at American universities. His name was given to the Laboratory of Diagnostic Techniques at the University of Warsaw.

Unfortunately, during the war period 1939-1945 both Polish psychology and aviation psychology practically ceased to exist. Psychology was practiced in private offices, by writing monographs or textbooks, which started to appear only after the Polish Thaw in 1956. After 1947, at three state universities, the reduced studies in psychology were held at the faculties of pedagogy and at the Catholic University of Lublin - at the Faculty of Philosophy.

Already in September 1945, works began on the establishment of a new medical and aviation facility called the Laboratory of Physiology and Aviation Hygiene. On June 1, 1946, the Aviation Hospital in Otwock was incorporated into the Laboratory and the Central Aviation Medical Laboratory with the Hospital and the Aviation and Medical Commission was established.

On May 1, 1947, the Central Laboratory of Aviation Medicine was transformed into the Central Institute of Aviation and Medical Research (CIAMR) with their seat in Warsaw. The Institute functioned in this organizational state until 1954, with a small participation of psychologists. Stanisław Trębaczkiewicz, holding a PhD in psychology, who was employed at the time, should be mentioned here. On January 14, 1955, the Central Institute of Aviation and Medical Research was renamed the Military Research and Experimental Institute of Aviation Medicine (MREIAM), with its seat in Warsaw, without the Aviation Hospital and the Main Military Aviation and Medical Commission.

PSYCHOLOGISTS WORKING AT THE MILITARY INSTITUTE OF AVIATION MEDICINE

Krystyna Galubińska - a graduate of the University of Poznań, she was employed in 1953 as a psychologist at the Department of Psychophysiology of the Military Scientific and Experimental Institute of Aviation Medicine, with its registered office in Warsaw. In 1965, she obtained her doctorate degree in humanities at the University of Warsaw under the scientific direction of Prof. Mieczysław Kreutz. She worked at Military Institute of Aviation Medicine (MIAM) until September 1973. Dr. K. Galubińska was dealing with adaptation of American tests (based on the Guilford Intelligence Model) to qualify candidates for military air service, including: pilots, navigators, flight managers, flight mechanics, etc. [1]. Dr. K. Galubińska also initiated research on the phenomenon of loneliness of pilots at high altitudes of flight and spatial disorientation in flights with-

out the visibility of the Earth. On May 28, 1958, the Military Research and Experimental Institute of Aviation Medicine was named the Military Institute of Aviation Medicine (MIAM) with its seat at Krasińskiego 54 street.

After 1956 the importance of psychology in aviation increased and in addition to Krystyna Galubińska, M.A., in 1959 a position of psychologist was created at the Main Military Aviation and Medical Commission and Jolanta Walicka, M.A., was employed.

Romuald Błoszczyński - a major of the air force in 1960, after graduating in military pedagogy from the Political-Military Academy (WAP), he started working initially as the head of the laboratory and then as the head of the Department of Aviation Psychophysiology at WIML. He obtained his doctorate degree in humanities in 1966 and the habilitatus degree in 1973 at the WAP. In 1977, under the supervision of col. Romuald Błoszczyński, a monograph entitled "Psychologia Lotnicza" ("Psychology in Aviation") was published, co-authored by the employees of the Department of Psychophysiology (Z. Baranowski, J. Maciejczyk, P. Pokinko, H. Świątek, J. Terelak), for which in 1978 they received the 3rd degree prize of the Minister of National Defense. Doc. Romuald Błoszczyński together with a team of psychologists took part in the research in the international program "Interkosmos". As part of aviation psychology, he was involved in psychological analysis of pilot activity, the influence of physical factors of flight environment on pilot activity, fatigue in pilots, explaining the psychological causes of air accidents. Together with J. Terelak, R. Kurzyński and J. Stender, R. Błoszczyński developed and constructed a device for automatic exposition of visual tests [15]. In 1980 he was transferred as a reserve colonel to the Academy of Internal Affairs.

Piotr Pokinko - a major of the air force, was sent to WIML in 1961 after completing the Master's studies at the Political-Military Academy. Initially, he was an assistant professor, the head of the psychology department at the Main Military Aviation and Medical Commission, and subsequently an acting independent researcher, temporarily acting as the head of the Department of Aviation Psychophysiology. In 1876, he obtained his PhD degree in pedagogical sciences at the WAP and habilitatus degree from the General Staff Academy in 1983. Dr. Piotr Pokinko and mgr Jan Terelak were involved in the application of aviation psychology to judicial examinations and in the development of a battery of psychological tests for psychological examinations of the flying personnel. Together with lt. col. eng. Jerzy Stendera they have developed electronic equipment for group psychological examinations of flying personnel, which shortened the time of examinations and allowed to examine a larger number of people at a time. For the development of methodology and equipment, the authors received a 3rd degree group award from the Minister of National Defence [10]. Col. dr. Piotr Pokinko has repeatedly been a member of the team of experts investigating air accidents and catastrophes. He worked at WIML until 1987, when he joined the Political-Military Academy as the head of the Department of Military Psychology.

Juliusz Gazda - a major of the air force, came to the Department of Aviation Psychophysiology in 1963 after training at the Kirov Medical Military Academy in Leningrad and as a medical practitioner he took over the management of the MIAM Aviation Psychophysiology Laboratory. He was dealing with aviation and medical problems of flight safety. Among other things, he has developed principles for accident investigation from the point of view of aviation medicine. He cooperated in the development of equipment for psychological examinations in the low-pressure chamber. He was also involved in accident hygiene and prevention. In 1974, he defended his doctoral thesis in aviation medicine at MIAM and in the same year, due to his health condition, with a title of a lieutenant colonel, he joined the military reserve force. He passed away in 1975.

Zbigniew Baranowski - an officer, he graduated in pedagogy from the Military Political Academy, started his work at the Department of Psychophysiology in 1964. During his work at MIAM, he was promoted to the rank of a lieutenant colonel. He wrote his doctoral thesis at the Political-Military Academy. He dealt with flight hygiene and safety. After about 10 years of work at the Department of Psychophysiology, in 1978 he became the head of the Military District Psychological Laboratory in Płock.

Henryk Świątek - pilot, with the rank of a major of the air force, for many years an aviation instructor at the Officer Aviation School in Dęblin. He was flying 18 different types of piston and jet aircrafts. His flying time was 2960 hours, including 1600 hours on jet planes. After graduating from Military Political in 1967 with a Master's Degree in Pedagogy, he joined the Department of Aviation Psychophysiology as an assistant professor. After obtaining a doctor degree in 1977, he took the position of the head of the clinical psychology laboratory. He was dealing with flight hygiene and safety as well as prognostic accuracy of tests of visual and motor coordination from the perspective of actual flights [12].

Janina Maciejczyk - started working at MIAM in 1963, a graduate from the Faculty of Philosophy in Psychology at the Catholic University of Lublin. Previously, she worked at the Psychiatric Clinic of the Medical Academy and the Department of Child's Neuropsychiatry. At the Department of Psychophysiology she was involved in diagnostic activities, i.e. examination of pilots undergoing hospital observation for some reasons or after air accident. In addition to diagnostic activities, she conducted qualification and selection tests for candidates to the Officer Aviation School, developed psychological examination programmes for candidates for aircraft training, as well as for pilots for particular types of aircrafts [7]. These programmes were implemented for use. In the years 1964-1967, Janina Maciejczyk participated in the Polish-American cardiac examination programme (WRA-POL) led by professor Zdzisław Askanas. She has obtained a second degree in clinical psychology. In 1973, she defended her doctoral thesis at the University of Warsaw, entitled "Reaktywność a odporność pilotów na stres" ("Reactivity vs. resistance of pilots to stress"), written under the scientific direction of prof. dr. Jan Strelau. In her scientific work she dealt with the psychology of temperament and stress in case of aviation personnel [8]. In the years 2000-2003, she implemented an individual grant from the State Committee for Scientific Research, from which several electronic tests of the Viennese Test System were purchased for the Department of Psychology. This allowed to examine several pilots at a time. At the same time, she was involved in didactic activities during courses for aviation physicians and flight safety conferences. Dr. Janina Maciejczyk has published about 80 works, mainly experimental ones in Polish and foreign journals. She has actively participated in 20 national and international conferences and congresses. She has obtained certificates to examine people applying for weapons, as well as for the examination of drivers. She worked at MIAM until 2006. She was a valued employee, awarded with a military badge "Distinguished in aviation" as one of the few women.

Jan F. Terelak - a graduate form the Faculty of Philosophy, specializing in psychology at the Catholic University of Lublin. He started his work in 1968 as a psychologist at the Main Military Aviation and Medical Commission at MIAM. Previously, he worked at the State Sanatorium for the Sick with Neurotic Disorders in Komorów near Warsaw as a clinical psychologist and researcher in the Polish-American Research Programme VRA-Pol-65 on the rehabilitation of people suffering from chronic schizophrenic diseases.

After three years he was transferred to the Department of Aviation Psychophysiology for the position of a scientific assistant and researcher. In 1970 he began his doctoral seminar under the direction of prof. Jan Strelau at the University of Warsaw, where in 1973 he defended his doctoral thesis entitled: "Reaktywność mierzona indeksem alfa a cechy temperamentalne u pilotów" ("Reactivity measured with the use of Alpha index vs. temperamental feature in pilots"). In 1985, he received the Second Degree Award from the Minister of Higher Education and Technology (team award) for the book edited by J. Strelau entitled: "Rola cech temperamentalnych w działaniu" ("The role of temperamental features in action", Wrocław: Ossolineum, 1984). After his doctoral studies, he was appointed to military service in a group of medical psychologists at the captain's level and started working as an assistant professor at MIAM's scientific and research facilities. In the years 1978-1980 he took part in the Third Antarctic Expedition and as one of four psychologists in the 20th century he stayed for winter, together with a group of 20 people, at the Antarctic Station of the Henryk Arctowski Polish Academy of Sciences on King George Island, where he conducted unique research on the psychological effects of long-term social isolation from the perspective of astronautical needs. Research results of the research published in the book entitled: "Człowiek w sytuacjach ekstremalnych – izolacja antarktyczna" ("A man in extreme situations - Antarctic isolation") was the basis of habilitation, which was carried out in 1983 at the Faculty of Psychology of the University of Warsaw. After his habilitation, he was appointed to the position of assistance professor and head of the Department of Aviation Psychology.

During his work at MIAM, Jan Terelak published over 200 scientific publications, both in domestic and foreign journals, both original [19] and review ones, as well as over a dozen books (monographs, textbooks and scripts), including those on aeronautical and space topics [22,26,27,31]. He participated in the international research programme "Interkosmos" in the Section of Biology, Psychology and Space Radiobiology, within the scope of which he participated in numerous scientific conferences, and in the following years he was a member of the Working Group of Psychologists of NATO and has actively participated in congresses and scientific conferences in Western countries. He has been a member of many prestigious sci-

Fig. 2. Department of Aviation Psychology in 1968 (first row, from the left: Janina Maciejczyk, MSc., Jan Trojanowski, MSc., Krystyna Galubińska, PhD., Professor Mieczysław Kreutz (consultant of the Military Institute of Aviation Medicine), major Juliusz Gazda, MD (department head), major Pilot Henryk Świątek; (second row, from the left: lieutenant colonel dr. Romuald Błoszczyński, Jan Terelak, MSc., lieutenant colonel Piotr Pokinko, major Zbigniew Baranowski, MSc. (J.F. Terelak's own archives).

entific institutions and organizations, such as: Polish Association of School and Vocational Advisers - (2010 to date); Polish Geographic Association (Polar Club) - (1981 to date); European Association for Aviation Psychology - (1991 to date); The International Military Testing Association - (1993 to date); Polish Scientific Association Human in Extreme Conditions, Polish Association of Psychology of Organization, Polish Psychological Society, Polish Ergonomic Society, Committee for Space and Satellite Research at the Presidium of the Polish Academy of Sciences, Committee of Ergonomics at the Presidium of the Polish Academy of Sciences, Committee of Psychological Sciences.

In 2000 he received the title of a professor and so far is the only military psychologist with the title of a professor in the entire 100-year history of the Polish Army. He published dozens of articles and monographs in the field of aviation psychology, chronopsychology, stress psychology, work psychology, ergonomics. He presented his scientific and research achievements at several dozen scientific conferences in Poland and abroad and took part in numerous scientific search queries at foreign universities and scientific institutes[1].

1 E.g.: Military Selection and Training Centre in Split (Croatia, October 2000), Defense Security Service and Defense Manpower Data Center (USA, November 1999), Ministero della Difesa, Direzione Generale della Leva - 3 Divisione Selezione Attitudinale, Firenze (Italy, May 1999), Centre d'Etudes en Sciences Sociales de la Defensa in Paris (France, May 1998), Directorate of Psychology - Air Force Suite of Department of Defence in Sydney (Australia) and University of Sydney (October 1997), Military Institute of Aviation Psychology in Vienna (Austria, May 1997), Recruitment and Selection Centre in Brussels (Belgium, May 1996), Centro de Psicologia Aplicada do Exercito in Lisbon (Portugal, May 1995), Royal Netherlands Army Selection Center in Amsterdam (Netherlands, October 1994), Universita Salesiana in Rome (Italy, May 1993), Ohio State University in Columbus (USA, April 1993), University of Cincinati in Cincinati (USA, July 1993), Wolfson College in Cambridge (England) (July 1992), Russian Academy of Sciences in St. Petersburg (Russia, September 1991), German Academy of Sciences in Berlin (Germany, May 1987), Centro de Psicologia Aplicada do Exercito Militare in Havana (Cuba, April 1986), Slovak Academy of Sciences in Košice (Slovakia, May 1985), Institute of Aviation Medicine in Prague (Czech Republic, July 1984), - Institute of Aviation Medicine in Ketchkemet (Hungary, June 1983), Institute of Aviation Medicine in Bucharest (Romania, May 1982), Institute of Medical and Biological Problems of the Ministry of Health in Moscow (December 1982), Institute of Aviation Medicine in Sofia (Bulgaria, May 1981), Institute of Aviation Medicine in Kënigsbridge (Germany, June 1981).

Prof. Jan Terelak has supervised 19 PhDs, including 4 in aviation psychology (Zdzisław Kobos, Tadeusz Jasiński, Adam Tarnowski, Olaf Truszczyński). During military service, the scope of duties included participation in the investigation of accidents, air catastrophes of military aviation, the data of which were presented at conferences and ministerial symposiums [17]. In 2002, he left MIAM to work at the Academy of Catholic Theology, now Cardinal Stefan Wyszyński University (CSWU) in Warsaw, where he is the Head of the Department of Psychology of Work and Stress and the Director of the Inter-institutional Central Psychological Laboratory, consisting of 8 direct laboratories, and for two terms he was a member of the Senate of CSWU. He was employed again at MIAM between 2008-2018, where he held the position of Scientific Consultant of the Institute Director, and later of the Department of Aviation Psychology, for many years holding also the position of editor-in-chief of the scientific journal: "Polski Przegląd Medycyny i Psychologii Lotniczej" later issued under the name of "The Polish Journal of Aviation Medicine, Bioengineering and Psychology". He was also editor-in-chief of the journal titled "Zeszyty Naukowe WSSM" and co-editor of "Studia Psychologica" as well as a member of editorial committees of many scientific journals, such as: "Studia Leopoliensia" (Lviv), "Studia Ecologicae et Bioethicae", "Kultura Fizyczna", "Postępy Astronautyki", "Medycyna Lotnicza". Apart from his work at MIAM and Cardinal Stefan Wyszyński University in Warsaw, Jan Terelak, in the years 1996-2001 was the Deputy Dean of the Faculty of Administration at the Suwalsko-Mazurska University in Suwałki, in the years 2002-2004 the Dean of the Faculty of Psychology, and later in 2004-2010 its Rector. Moreover, in the years 2010-2014 he was the director of the Institute of Psychology and a member of the Senate at the College of Public Administration in Białystok. His specializations include: clinical psychology (second degree specialist and in 1999-2002 a consultant to the Minister of Health and the Ministry of National Defence in the field of clinical psychology), aviation and space psychology, transport psychology (certified specialist).

Research interests of prof. Jan Terelak concern clinical psychology, methodology of psychological research, psychology of stress, psychology of work (aviation, space, road transport psychology), ergonomics, psychology of organization and management. For example, the issues of stress psychology include: psychological mechanisms of human functioning in extreme situations (social isolation, monotony), the psychological cost of adaptation to extreme situations, especially long-term, the dynamics of small task groups in isolation situations, the criteria for psychological selection of the so-called stress-resistant people (cosmonauts, pilots, polar explorers, professional athletes, directors, surgeons, etc.) [16]. In the field of occupational psychology, research interests focus on the oculomotor mechanisms of visual attention and psychomotor coordination. In turn, within the scope of organizational psychology and interest management, they concern modern human resources management systems (CRM - Crew Resource Management), mainly in small task groups (e.g. flight crews, space crews, high-level managers, etc.) [25,28]. The issue of stress psychology covers the characteristics of various stressful professions, including aviation and uniformed professions, and many years of research in this field are the subject of numerous monographs [20,21,24,32].

Jacek Szczechura - employed in 1978 at the MIAM Department of Aviation Psychophysiology as an assistant professor as he came there as a PhD in natural sciences from the Department of Neurophysiology at the Institute of Experimental Biology of the Polish Academy of Sciences. Initially he was employed as a civilian worker and then as a military worker. While working at MIAM, he dealt with the issue of eyeball movements in the perception of visual information by pilots. He presented the results of his research at international conferences as well as in articles in Polish and foreign magazines [11]. Moreover, the activity of dr. Szczechura was related to the profile of the ministerial institute and concerned psychological measurements of the effectiveness of pilot fitness training, application of tests for the study of spatial orientation in a flight simulator and selection of candidates for aviation as well as application studies in the field of aviation ergonomics [18]. In 2002, Jacek Szczechura, PhD, with a title of a lieutenant colonel was transferred to the military reserve force and left MIAM. Currently, he is the head of the Visual Psychophysiology Laboratory at the Faculty of Interior Design of the Warsaw Academy of Fine Arts.

Zdzisław Kobos - a graduate of psychology at the Jagiellonian University in Cracow, he began his professional military service in 1980 as a senior psychologist at the 6th Military Aviation Hospital in Dęblin, then became the head of the Psychological Laboratory. In 1987 he was sent to work at the Main Military Aviation and Medical Commission at MIAM. In 1992, he was writing his doctoral thesis at the Jagiellonian University in aviation psychology on the basis of a doctoral dissertation entitled "Typologiczne determinanty efektywności praktycznego szkolenia lotniczego" ("Typological determinants of the practical avia-

tion training effectiveness"), written under the scientific direction of doc. dr. hab. Jan Terelak. Apart from certification work, he also dealt with aviation psychology, occupational psychology and ergonomics, as well as flight safety. He has numerous scientific achievements in the form of articles in national and foreign magazines and has actively participated in many conferences and scientific congresses [4]. As lieutenant colonel, he left MIAM in 2012. Currently, he is working at the Institute of Psychology at the Cardinal Stefan Wyszyński University in Warsaw and at the Military Aviation and Medical Commission.

Jan Turlejski - a graduate of the University of Poznań in 1968 and a specialist in second-degree clinical psychology, worked at the Main Military Aviation-Medical Commission at MIAM in 1978-1989. He wrote his doctoral thesis in 1988 at the University of Warsaw, on the basis of a doctoral dissertation, written under the scientific supervision of prof. Jan Strelau. After his doctoral studies he was employed at the Department of Psychology of the Academy of Physical Education in Warsaw. In 1997 he returned to work at MIAM, the Main Military Aviation-Medical Commission, where he worked until his retirement in 2006. He has been dealing with aviation-medical reports, psychological diagnostics and psychometrics. He had a great and well-established psychological knowledge, unfortunately, he published little. He died on April 8, 2017.

Tadeusz Jasiński - worked at the Department of Aviation Psychology at MIAM in the years 1991-2005. He defended his doctoral thesis entitled "Wpływ stresu przyspieszeń +Gz na funkcjonowanie operatorskie pilotów" ("Influence of +Gz acceleration stress on the operation performance of pilots"), written under the scientific direction prof. Jan Terelak, at the Academy of Physical Education in Cracow. Research interests concerned the impact of aviation acceleration on the well-being and efficiency of piloting the high performance aircrafts [2]. He has published many works, mainly in "Medycyna Lotnicza". After leaving MIAM, he habilitated and took up employment in private universities.

Olaf Truszczyński - a psychology graduate from the University of Łódź and from the Military Medical Academy, after which he was promoted to an officer's degree. Firstly, he worked at the Department of Labor Psychology and Military Service of the Institute of Psychological Hygiene, in a branch of the Military Medical Academy in Warsaw, and then in 1991 he took up a job at the Department of Aviation Psychology at MIAM. In 1998, he defended his doctoral thesis at the Academy of Catholic Theology, entitled "Wpływ stresu hipoksji na funkcjonowanie psychomotoryczne pilotów" ("Influence of hypoxia stress on psychomotor operation of pilots"), written under the scientific supervision of prof. Jan Terelak. After his doctorate, he was promoted to the positions of assistant professor and head of the Aviation Psycho-diagnostics Laboratory at the Department of Psychology of MIAM, and in 2001 to the head of the Department of Safety of Flights at MIAM. He completed a course in investigation of aviation accidents and disasters in the UK and Sweden. He completed an internship at the Air Force base of the United States Navy. He is the author or co-author of about 50 scientific articles on aviation and military psychology [34]. He has presented the results of his research at numerous national and international conferences [33]. In the years 2003-2016 he was the director of the Military Institute of Aviation Medicine in Warsaw. In 2004 he was the organizer of the European Association for Aviation Psychology Conference (EAAP) in Warsaw. He is a member of numerous scientific associations, among others: "European Association for Aviation Psychology" and "The International Military Testing Association".

Adam Tarnowski - graduated in psychology from the Academy of Catholic Theology in Warsaw, then started working in 1992 at MIAM, where until 2002 he worked as an assistant at the Department of Aviation Psychology at MIAM. In 1998, after completing his doctoral studies at the Faculty of Psychology of the University of Warsaw, he received a doctoral degree in humanities from the Jagiellonian University in Cracow, on the basis of the doctoral dissertation entitled "Wpływ uwagi na skokowe ruchy oka w sytuacji decyzyjnej" ("The influence of attention on saccades during the decision-making situation"), wrote under the scientific supervision of prof. Jan Terelak. His scientific interests concerned the oculomotor mechanisms of visual attention and psychometric issues related to validation of psychological tests [13,14]. After obtaining the degree of PhD habilitatus and after retiring from MIAM, prof. dr. Jan Terelak, was appointed the head of the Department of Aviation Psychology at WIML, which he held until 2016, while taking up at the same time a position at the Faculty of Psychology at the University of Warsaw.

Marian Macander - lieutenant colonel dr. Marian Macander graduated from the Military Medical Academy in Łódź and from the Faculty of Psychology of the University of Łódź in 1982 with a specialization in clinical psychology. He received his doctoral degree in medical sciences in 2003 at the Medical University of Łódź, on the basis of a thesis entitled "Wpływ katapultowań i poważnych zagrożeń życia na występowanie stresowych zaburzeń pourazowych u pilotów lotnictwa wojskowego" ("Influence of cata-

Fig. 3. Department of Aviation Psychology in 2002 (first row, from the left: Janina Maciejczyk, PhD, professor Jan F. Terelak, Jerzy Achimowicz, PhD (Eng), Jacek Szczechura, PhD, Tadeusz Sojka, MSc., ass. professor Kazimierz Migdał, Zdzisław Kobos, MSc., Tadeusz Jasiński, MSc.; sitting, from the left: Wiesława Domańska (Strupińska), technician, Teresa Ochalska, technician, Janina Szymańska, technician) (J.F. Terelak's own archives).

pults and serious threats to life on the occurrence of post-traumatic stress disorders in pilots of military aviation"). In the same year he passed an exam in specialization in clinical psychology. For many years he worked as a psychologist at the 6th Military Hospital in Dęblin, and at MIAM he has been working since 1998. Throughout his stay in Dęblin, he was responsible for choosing and selecting candidates for the Polish Air Force Academy in Dęblin and the Aviation High School in Dęblin and Zielona Góra. To date he has been involved in, among others, the psychological diagnosis of intellectual and psychomotor skills of flying personnel and is an expert in psychology at the Committee for Investigation of National Aviation Accidents. His scientific activity includes psychological analysis of causes of catastrophes in military aviation in the years 1945-2017 and civil aviation in the world in the years 1935-2017 as well as causes of catapults in the Aviation of the Polish Armed Forces in the years 1951-2017. Dr. Marian Macander deals with the investigation of the causes of air accidents on various types of jet planes in the years 1951-2014 [5]. He is, among others, an appeal psychologist in the field of psychology in the Aviation of the Polish Armed Forces for the needs of the Central Military Medical Commission and in the Civil Aviation Office for the needs of the Chief Civil Aviation Physician.

Other aviation psychologists working for MIAM in the last half century should not be ignored, such as: dr. Leszek Radomski (a graduate from the Jagiellonian University), dr. Kazimierz Migdał (graduate from the University of Warsaw and Political-Military Academy), commander dr. Julian Wonicki (graduate from the Political-Military Academy), Krystyna Otrocka, MA (graduate from the University of Warsaw), Mariusz Turek and Tadeusz Sojka, MA.

The last decade of the 90 years of existence of MIAM is represented by the following aviation psychologists working in the Department of Aviation Psychology: dr. Piotr Zieliński (head of the department), dr. Marcin Biernacki, Marta Szlakowska, MA, Magda Bicka-Capała, MA, Alicja Kamińska, MA, Marta Górska, MA and Katarzyna Łapkiewicz, MA, who focus on examination of candidates for the Air Force High School in Dęblin, candidates for the Polish Air Force Academy in Dęblin, examination of air traffic controllers, ground staff and periodical examination of air personnel. In addition to the Department of Aviation Psychology, the following people work at MIAM: mgr Michał Janewicz (Department of Simulator Research, Training and

Aviation-Medical Practice), dr. Paulina Baran, (Department of Air Simulators Innovation). Undoubtedly, the leaders in this group of aviation psychologists, among others, are: P. Zieliński and M. Biernacki, whose scientific profiles are presented below.

Piotr Zieliński - defended his Master's thesis at the Department of Psychology of the University of Warsaw in 2003 and his doctoral thesis in 2008 at the same University, devoted to the influence of colorful stimuli on human functioning. He came to the Department of Aviation Psychology at MIAM from the Police Training Centre in Legionowo. Since 2008 he has been employed at the Department of Aviation Psychology at MIAM, where in 2013 he became the head of the Diagnostics and Psychological Reports Laboratory and after dr. Adam Tarnowski left his work, since 2016, he has been the Head of the Department of Aviation Psychology. He is a member of the European Association for Aviation Psychology. He is an active participant of international and national conferences on aviation psychology and psychological diagnosis, he publishes in scientific journals. He specializes in psychometrics and the influence of various flight factors on the operational efficiency of pilots [36]. His scientific interests also include assessing the accuracy of diagnostic tools used in examination of pilots. He is a co-author of detailed methods of psychological research of various groups of aviation personnel and candidates for aviation. On a daily basis, he deals with psychological diagnostics, mainly of military air force personnel, as well as psychological examinations of candidates for the General Aviation High School and the Air Force Officer School in Dęblin. He also uses his knowledge and experience as a teacher, conducting classes in psychometrics and standard diagnostics, cooperating with the Faculty of Psychology at the University of Finance and Management in Warsaw and with the Faculty of Psychology of the University of Warsaw.

Marcin Biernacki - defended his Master's thesis in 2004 at the Faculty of Psychology of the University of Warsaw and his doctoral thesis in 2013 at the same university. Immediately after graduation he started working at the Department of Aviation Psychology at MIAM, and in 2013 he became the head of the Experimental Psychology Laboratory. In 2007, he participated in the "International Summer School on Aviation Psychology" at the University of Graz, where he obtained a certificate of aviation psychologist and became a member of the European Association for Aviation Psychology (EAAP). Marcin Biernacki, PhD, actively participates in international and national conferences on aviation psychology and psychological diagnosis. He has published several dozen articles in prestigious aviation magazines, such as: "Aviation, Space and Environmental Medicine", "Journal of Gravitational Physiology", "Polish Journal of Aviation Medicine, Bioengineering and Psychology". His research interests focus, among others, on the environmental conditions of operational efficiency, including +Gz overload and hypoxia (simulator disease). The application tests concern the diagnosis and selection of persons performing operator tasks (pilots, drivers of road vehicles) within the scope of cognitive tasks [35].

AUTHORS' DECLARATION:

Study Design: Janina Maciejczyk, Jan F. Terelak; **Data Collection:** Janina Maciejczyk, Jan F. Terelak; **Manuscript Preparation:** Janina Maciejczyk, Jan F. Terelak. The Authors declare that there is no conflict of interest.

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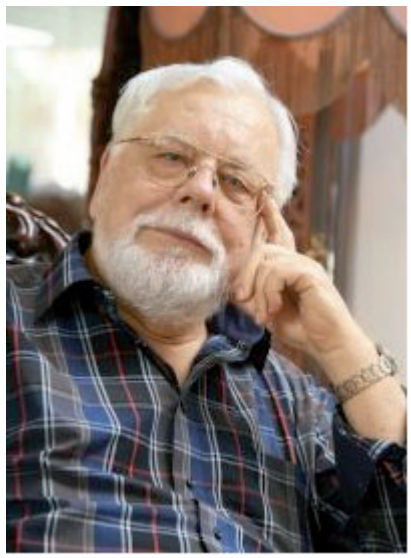

CHARACTERISTICS OF THE SCIENTIFIC AND IMPLEMENTATIONAL ACTIVITIES OF AVIATION PSYCHOLOGISTS AND SCIENTIFIC CONSULTANCY FROM THE PERSPETIVE OF THE 90 YEARS OF EXISTENCE OF THE MILITARY INSTITUTE OF AVIATION MEDICINE

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Abstract: The author of this publication worked at Military Institute of Aviation Medicine (MIAM) in Warsaw in 1968-2018 with a small break. The paper is of a review nature and concerns the presentation of the scientific and implementational activities of Polish aviation psychologists from the perspective of the last half-century of the existence of the Military Institute of Aviation Medicine in Warsaw. The scientific activity includes, among others, empirical research on the assessment of mental and motor skills during tests in flight simulators: thermo- and diving chambers and centrifuges, while application research concerns mainly psychometric adaptation of psychological selection of candidates for military aviation and space flight and selection of military and civilian pilots. The organizational activity is related to the construction of tests and technical devices for group psychological research. The interdisciplinary nature of research is emphasized, thanks to cooperation of aviation psychologists with many specialists of aviation medicine and bioengineering.

Keywords: aviation psychology, flight simulators, space psychology, chronopsychology, polar psychology, psychological selection and pilot selection

Figures: 14 • **References:** 58 • **Full-text PDF:** http://www.pjambp.com • **Copyright** © 2017 Polish Aviation Medicine Society, ul. Krasińskiego 54/56, 01-755 Warsaw, license WIML • **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education

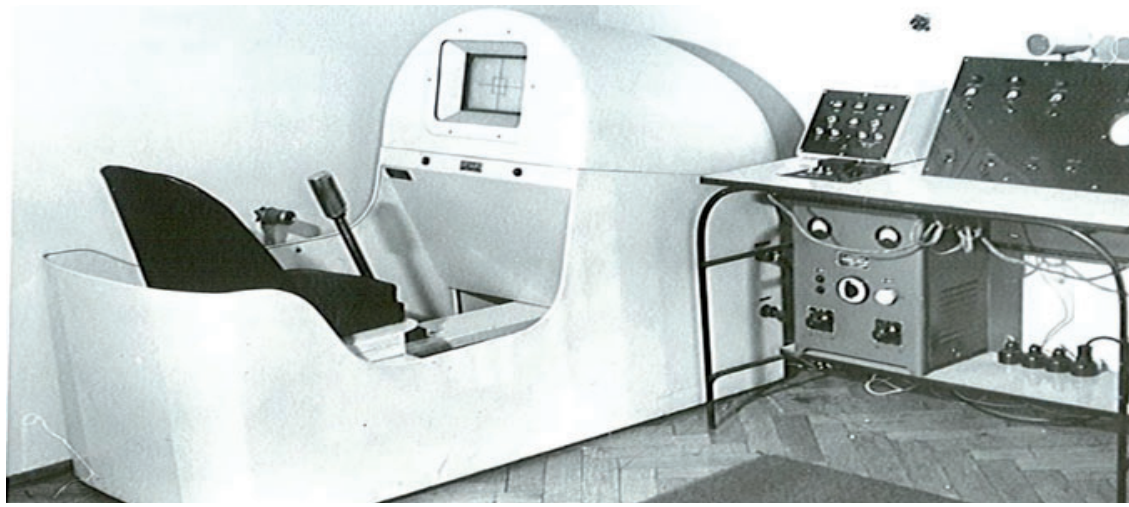

Fig. 1. One of the first SMA-3 British simulators in the 1970s to study attention and visual-motor coordination.

INTERDISCIPLINARY NATURE OF RESEARCH OF POLISH AVIATION PSYCHOLOGISTS

The wide range of scientific and implementational activities of aviation psychologists at MIAM was a result of its specificity resulting from the interdisciplinary nature and organizational autonomy. The psychologists working at MIAM had full organizational autonomy within the framework of the Psychometric Laboratory initially established at the Center for Aviation-Medical Research, and then at the Psychophysiology Department, which was transformed into the Aviation Psychology Department. Although the first head of the department was a physician mjr. Juliusz Gazda, MD his successors were psychologists. This, of course, did not prevent us from carrying out many interesting works of an interdisciplinary nature. Aviation psychologists have been cooperating to a significant extent with practically all theoretical clinics, facilities or labs. For example, psychological research carried out in cooperation with a psychoneurological clinic and an electroencephalography laboratory were unique not only in Polish psychology but also in the world. The substantive assistance of prof. Zbigniew Edelwein and prof. Jan Miszczak made it possible to use EEG records to calculate the so-called alpha index in a resting situation to diagnose pilots' temperament [30]. Other areas of cooperation with neurologists concerned among others: microwave effects on mental functions [10], effects of some neurological medicines on psychomotor performance and attention of a pilot [12]. On the other hand, the cooperation with the internist clinic concerned mainly the pathogenesis of psychosomatic disorders of pilots in relation to aviation stress [9], while the laryngological clinic was a substantive support for psychologists in posturographical examinations and the mechanism of spatial disorientation of pilots [18]. Interesting research was conducted in cooperation with a clinic and an ophthalmological laboratory on spatial vision and the oculomotor saccade mechanism of visual attention[17]. Psycho-pharmacological and psycho-toxicological research conducted in cooperation with specialist research laboratories of MIAM, led by prof. W. Święcicki and dr. Z. Koter, allowed to determine the influence of various types of drugs on the mental and motor fitness of a pilot [23]. Contacts with the Performance and Physical Education Department, led by dr. Henryk Sulajnis, and later by dr. Krzysztof Klukowski, in cooperation with assistant professor Zbigniew Sarol focused the psychological research on the evaluation of the effectiveness of pilots' rest in Military Training and Fitness Centers in Gronik and Mrągowo [25].

Attention should be drawn to psychological research conducted with the use of unique flight simulators: thermal chambers [24], diving chambers [15], centrifuges [2], catapults [1], aviation gymnastic equipment [22] and flight simulators [7].

Psychological tests were also carried out on dynamic simulators as well as in real flight conditions. It was possible because we had a psychologist in the team, lieutenant colonel dr. Henryk Świątek, who was a combat pilot and flight instructor in school regiments.

INTRODUCTION OF NEW SCIENTIFIC DISCIPLINES IN POLISH APPLIED PSYCHOLOGY

Space Psychology - as part of MIAM's research programme Polish Academy of Sciences (PAN) and INTERKOSMOS within the Department of Space

Rig. 2. The Original Space Questionnaire ("Oprosnik") signed by the Cosmonaut Mirosław Hermaszewski, who filled it in on the flight on the ship "Sojuz".

Psychology led by dr. Romuald Błoszczyński and later dr. Jan Terelak, a new field of applied psychology, namely space psychology, was established. The issue of space psychology included, among others: selection of candidates for the first Polish astronaut, experiments on spacecraft (e.g. Relaxation), theoretical aspects of selection of crews of spacecraft, psychological effects of isolation, etc. These issues were studied in the years 1986-1991 within the framework of the Central Programme for Basic Research 01.20 entitled "Gwarancja niezawodności psychologicznej członków załogi w długotrwałych lotach kosmicznych" ("Assurance of psychological reliability of the crew members in long-term space flights") carried out under the intergovernmental INTERKOSMOS programme and coordinated Space Research Centre of the Polish Academy of Sciences. Scientific research conducted by Jan Terelak included two natural experiments, conducted in extreme conditions of space flight and the most unfriendly conditions on Earth for humans - Antarctic conditions. Research carried out at the space station (Orbital Assembly "Salut 6 - Soyuz 29 Vostok") under the cryptonym "Oprosnik" (Questionnaire) to assess the redistribution of working and resting time of cosmonauts on real flights and the behavioral effects of operation in changed photo-ecological conditions (biorhythms).

Polar psychology - connected with the second natural experiment conducted by dr. Jan Terelak during a one-year stay at the Antarctic Station of the Polish Academy of Sciences named after H. Arctowski in Antarctica, on the

Fig. 3. Team performing the first historical appendectomy in the H. Antarctic Station of the Polish Academy of Science on the 22nd December 1978 (upper row, from the left: dr. Józef Domaszuk (surgeon from the Military Institute of Aviation Medicine), dr. Jan Terelak (psychologist from the Military Institute of Aviation Medicine, as "anesthesiologist"), dr. Maciej Rembiszewski (head of winter camp); lower row: Marian Bieńko (patient-fishermen from the m/t "Jowisz"), dr. Anna Jakubiec-Puka (biologist from the Polish Academy of Sciences, as "scrub nurse").

psychological effects of social isolation as the precursors of behavior in future long-term space expeditions. The description of the experiments and the results of the research are presented in two books [46,47]. The research is unique in the global literature on the subject, as only four psychologists in the twentieth century participated in such an experiment personally, and because the research was conducted every two weeks for a year, which allowed to determine the dynamics of changes in the behavior of many psychological parameters. Also unique was the experience of a polar psychologist, who in extreme circumstances was a member of a "unique" team, which performed four surgical operations, as illustrated in fig. 2. In addition, problems of adaptation to low temperatures [24] and the body's reaction to changed photoecological [5] conditions were the subject of research in extreme Antarctic conditions.

Chronopsychology - referring to a new chronobiological paradigm. Psychologists undertook interdisciplinary research in the years 1978-1990 carried out within the framework of the governmental programme R III-14 on "The influence of biological rhythms on human and animal organisms", concerning the moderating role of circadian rhythms on the daily mental and psychomotor performance of military pilots, as well as the evaluation of the effectiveness of multi-shift [4] work and the "jet pilot syndrome" in transcontinental flights in LOT Polish Airlines [32]. Work was also undertaken on the Polish version of the questionnaire method of examining morning vs. evening chronotypes [28].

IMPROVING SCIENTIFIC QUALIFICATIONS

During the discussed period, aviation psychologists obtained the following titles and scientific degrees: 15 persons obtained doctoral degrees (R. Błoszczyński, K. Galubińska, Z. Baranowski, H. Świątek, J. Maciejczyk, J. Terelak, L. Radomski, Z. Kobos, M. Wonicki, J. Turlejski, J. Szczechura, O. Truszczyński, T. Jasiński, A. Tarnowski, M. Macander). Out of this group, 5 persons (R. Błoszczyński, P. Pokinko, J. Terelak, A. Tarnowski, T. Jasiński) obtained the degree of PhD habilitatus, while 1 person obtained the title of a "presidential" professor (J. Terelak) and this is the only case in the entire history of the 20th century Polish military and aviation psychology.

PARTICIPATION OF POLISH AVIATION PSYCHOLOGISTS IN ADAPTATION OF RESEARCH EQUIPMENT AND VALIDATION OF TESTS USEFUL FOR EXAMINATION OF FLYING PERSONNEL

Access to many modern flight simulators, as well as the construction of our own research equipment in cooperation with MIAM engineers made that the research facilities of aviation psychologists had no equals compared to psychological laboratories at Polish universities. It has also often been an advantage of the willing cooperation with the Department of Aviation Psychology of many civil scientific institutions in Poland. An example is the development of the first concept and the implementation of "Apparatus for group psychological research controlled electronically" (Ministry of National Defence Award) and devices for automatic exposition of visual tests [14,20], or Poland's first "Computer-controlled psychological laboratory" [38], or finally the "Computer System for Psychological Testing", called the "Warsaw Test System" [21]. It should also be added that the Department of Aviation Psychology was the first in Poland to use computer versions of the tests for the selection of pilots and subjected it to public assessment by the community of psychologist [39] and had the most modern set of laboratory equipment called the "Viennese Test System", including a library of several dozen psychological tests and coupled with external coordinators, which allowed for comprehensive research of cognitive processes (intelligence, memory, attention), personality as well as visual and motor coordination, and which at that time was the world standard in the best scientific institutions [53]. It should also be noted that the Department of Aviation Psychology had an apparatus, unique on a global scale, for examining visual attention processes at the level of saccade eye-movement (NAC-4 and NAC-5). The research conducted in the Department of Psychology with the use of an eye tracker was unique not only in Poland, both in the scope of basic research [16,19], but also applied ones, e.g. in solving ergonomic problems in designing a cabin of a prototype of a Polish helicopter based on the MI-2 structure [27].

CONTACTS BETWEEN MIAM PSYCHOLOGISTS AND THE SCIENTIFIC WORLD OF PSYCHOLOGISTS

One should also mention the cooperation of the Department of Psychophysiology and then Aviation Psychology with the majority

of Polish universities (e.g. the University of Warsaw, Jagiellonian University, Catholic University of Lublin, University of Wrocław, Adam Mickiewicz University in Poznań, University of Gdańsk, University of Łódź) and foreign scientific and research facilities of similar interests (e.g. in Moscow, Prague, Dresden, Kecskemét, Bucharest) within the framework of the research programme of the Polish Academy of Sciences/ INTERKOSMOS led by MIAM. This cooperation was extended by the Western countries, when two years before Poland officially joined NATO in 1992, prof. Jan Terelak was invited to cooperate under the "NATO Psychologists Working Group", thanks to which for several years together with his younger colleagues, psychologists from WIML, they were able to participate annually in international scientific symposiums IAMPS (International Applied Military Psychology Symposium) or IMTA (The International Military Testing Association) and not only to present their own research results, but also to get acquainted with the equipment of research laboratories and methodology of selecting candidates for the army, including military aviation, in almost all modern armies of the world, including the American [55,56] and Australian ones [54]. At the same time, WEAAP (Western European Association for Aviation Psychology) was contacted, which had to change its name to EAAP (European Association for Aviation Psychology) due to procedural reasons before accepting Polish aviation psychologists. Thanks to this, we participate in scientific conferences organized by this company in many European countries. The crowning achievement of this cooperation was entrusting the organization of an international symposium in 2002, which took place in Warsaw to Polish side (Department of Aviation Psychology MIAM and Chair of Occupational Psychology and Stress at Cardinal Stefan Wyszyński University in Warsaw)[50]. Following Poland's accession to NATO and the European Union, the community of Polish aviation psychologists accepted research standards [51,52], also having experience gained during peacekeeping missions [57].

EXPERT, POPULARIZATION AND EDUCATIONAL ACTIVITY IN THE FIELD OF AVIATION PSYCHOLOGY

The expert activity concerns the participation of psychologists as members of the Subcommittee Investigating Disasters and Accidents in both military and civil aviation and concerns, on the one hand, the participation in the investigation of a specific aviation event and, on the other hand, the development of research procedures and training of young students of aviation psychology [26]. Educational activity was connected both with lecturing in aviation psychology for doctors specializing in aviation medicine and writing scripts for them in the special periodical journal "Informacja Lotniczo-Lekarska WIML" [35] ("Aero-Medical Information WIML"), writing popular science articles for aviation magazines, such as "Astronautyka" [42] ("Astronautics"), or "Przegląd Wojsk Lotniczych i Wojsk Obrony Powietrznej Kraju" [37] ("Review of the Air Forces and the Air Defense Forces of the Country") and "Informator Instytutu Technicznego Wojsk Lotniczych" [29] ("Informer of the Air Force Institute of Technology").

The scientific educational activity concerned writing scientific articles on aviation psychology in scientific specialist journals, e.g. "Medycyna Lotnicza" ("Aviation Medicine"), "Polski Przegląd Medycyny Lotniczej" ("Polish Journal of Aviation Medicine"), "Aviation, Space and Environmental Medicine" and "International Journal of Aviation Psychology". An important educational activity was writing popular-scientific [36] books and monographs as well as textbooks in the field of aviation psychology [41,43]. Documentation of bibliographies on the achievements of Polish aviation psychology was successively published in scientific psychological journals [8,31]. It is also worth noting that Jan Terelak translated a textbook from the Russian language (with a Polish preface), written by the classics of aviation and space psychology B.F. Lomov and K.K. Platonov in 1984 [6].

Finally, it is worth mentioning that military psychology, and within its framework aviation psychology, is the oldest discipline of applied psychology in Poland, with significant achievements both in Polish and global science, which is worth emphasizing on the occasion of such a beautiful 90th anniversary of the cradle of aviation medicine and psychology in Poland.

RETINUE OF SCIENTIFIC CONSULTANTS IN THE FIELD OF PSYCHOLOGY

It is worth to describe briefly the silhouettes of MIAM scientific consultants in the field of psychology, who over the years have been preparing the staff of specialists in a niche field which undoubtedly is aviation psychology.

Bohdan Zawadzki (1902-1966). After repatriation from Ukraine to Poland, he graduated from the Zamoyski Junior High School in Warsaw in 1920, and then took up psychology studies at the University of Warsaw under the direction of prof. Władysław Witwicki. After completing studies as an assistant at the Department of Psychology under the direction of prof. Władysław Witwicki, he defended his doctoral dissertation in 1928 "O komizmie. Studium Psychologiczne." ("On comedy. Psychological study"). He combined the work of an assistant and later a lecturer (1930-1932) at the University with his practice at the Center for Aviation and Medical Research, where, together with mjr. dr. Włodzimierz Missiuro, created the Psychological and Physiological Laboratory. In the years 1929-1930, he complemented his psychological studies in Berlin, and in the years 1932-1933 in Vienna under the supervision of Karol and Charlotte Buhler. In the years 1933-1934, he continued his studies in the United States. After his return to Poland in the years 1935-1936, he took over the management of the Department of Psychology at the Stefan Batory University in Vilnius. After the liquidation of the University in Vilnius, in February 1940 he left again for the United States, where he taught at various universities (Smith College, Wellesley College, Sarah Lawrence College). In the years 1946-1966, he worked as a professor of psychology and psychopathology at the City College of New York. While staying in the USA, he maintained intensive contacts with Poland, repeatedly feeding psychological libraries in the country with scientific literature.

Fig. 4. Prof. Bohdan Zawadzki (1902-1966), http://psych.uw.edu.pl/o-nas/historia/slawni-profesorowiezasluzeni-pracownicy/bohdan-zawadzki/ (12.10.2017).

The sympathy of prof. Bohdan Zawadzki to Military Institute of Aviation Medicine in Warsaw was associated with a proposal to transfer a part of his scientific library in the field of psychology and psychiatry after the war, which was thwarted due to political reasons and eventually the library was taken over by the Psychometric Laboratory of the Polish Academy of Sciences[1]. Thanks to the courtesy of dr. Mieczysław Choynowski, we made use of this library in a protectionist manner, and especially of the 20-volume series concerning psychological tests for the examination of mental and psychomotor skills, developed under the editorship of a world-renowned intellectual theoretician prof. J.P Guilford. As a result, most of the psychological tests used in Poland to examine aviation abilities are adaptations of the tests of American military aviation.

Włodzimierz Missiuro - graduated in medicine with the title of a doctor of all-medical sciences. He specialized in physiology. After Poland regained its independence, he was admitted to the Polish Army. He was promoted to the rank of a major physician with seniority on June 1, 1919. In the years 1923-1924, as an officer of the 7th Sanitary Battalion from Poznań with the rank of "additional officer", he was a physician at the Central Military School of Gymnastics and Sports. In 1928, he became a deputy head of the Centre for Aviation and Medical Research, and in 1932 he served at the Central Institute of Physical Education in Warsaw. He was later promoted to the rank of a lieutenant colonel, physician. From 1933 to 1938 he was a lecturer at the Physiology Laboratory of Education and Sport at the Department of Human Physiology of the Faculty of Medicine of the University of Warsaw. From 1931 to 1939, he was the head of the Physiology Department at the University of Physical Education in Warsaw. In 1937 he co-organized the Polish Society of Sports Medicine. He was a member of the Housing Cooperative Association of the Professors of the University of Warsaw [11].

After the outbreak of the Second World War, during after the Soviet aggression against Poland on September 17, 1939, a day later he was arrested by the Soviets. He was held in the prisoner-of-war camp in Kozielsk from 1939 to 1939. Later, he stayed in the camp in Pawliszczew Bor. From June 24, 1940 to September 31, 1941, he was imprisoned in the NKVD prisoner-of-war camp in Gryazovets. Under the Sikorski-Majski Agreement of July

1 Currently, the library is located at the University of Warsaw in the Diagnostic Techniques Laboratory at the Faculty of Psychology of the University of Warsaw, named after prof. Bohdan Zawadzki.

30, 1941, he regained his freedom and joined the Polish Army formed in the USSR led by gen. Władysław Anders. He was employed as a lecturer at the Department of Physiology at the Polish Faculty of Medicine in Edinburgh.

After the liberation, he returned for a short period of time to Łódź, where he took over the Chair of Occupational Medicine of the Faculty of Medicine at the local university, already as a full professor, and then moved to take the same position in Warsaw, at the same time taking over the management of the Department of Physiology at the University of Physical Education. He established the Scientific Institute for Physical Culture and the Scientific Committee for Physical Education. He managed the Chair of Human Physiology at the Medical Academy in Warsaw. Prof. Włodzimierz Missiuro carried out scientific consultations with Military Institute of Aviation Medicine aviation psychologists [13] on the psychological and physiological mechanisms of fatigue. He published scientific papers in the field of sports physiology, aviation and labor. From 1929 to 1932 he was the editor of the quarterly "Przegląd Sportowo-Lekarski" ("Sport and Medical Review") - a quarterly devoted to the physiology, pathology and hygiene of sport, physical education and work. One of his assistants was dr. Krystyna Nazar, later working at the Polish Academy of Sciences, and being a scientific consultant at MIAM.

Fig. 5. Włodzimierz Missiuro (1892-1967), http://www.wuw.pl/data/include/cms/monumenta-ebook/pdf/Portrety-Uczonych-Profesorowie-UW-po-1945-L-R.pdf (12.10.2017).

Biegeleisen-Żelazowski Bronisław - psychologist, engineer. He was one of the pioneers of the occupational psychology in Poland. As a professor at Lviv Politechnic, and in the post-war period at Warsaw University of Technology, the University of Warsaw and the University of Łódź - he dealt with issues related to health technology, psychotechnical research, psychology of work and work organization. He was also the organizer and director of the first Polish Psychotechnical Institute in Kraków (1925) [3]. In 1949, he was appointed an independent research worker at the Institute of Economics and Organization of Industry in Warsaw, where he established the Labor Standardization Department. In the 1960s, he founded and became the head of the Psychology Department at the Motor Transport Research Centre in Warsaw. In 1964 he published "Zarys psychologii pracy" ("The outline of Work Psychology"), which was used by the first aviation psychologists for learning and he willingly consulted MIAM psychologists on this subject, as well as an engineer in the field of aviation technology.

Fig. 6. 6. Prof. Bronisław Biegeleisen-Żelazowski (1881-1963), http://www.archiwum.wfis.uw.edu.pl/bibfis/wp-content/uploads/archiwum-cyfrowe/tablica-pamiatkowa-ku-czci-Kazimierza-Twardowskiego/t40.html (12.10.2017).

Mieczysław Kreutz - professor at the University of Warsaw and scientific supervisor of Military Institute of Aviation Medicine psychologists in the 1950s. Born in Lviv, where he graduated from a junior high school and from the Lviv University at the Faculty of Philosophy. He studied biology and philosophy under the supervision of Kazimierz Twardowski, among others. Since 1921 he has been an assistant at the Department of Psychology of the Jan Kazimierz University in Lviv. PhD degree in 1924, habilitation "Zmienność rezultatów testów" ("Variability of test results") in 1927. Since 1928, a deputy professor and head of the Department of Psychology (after Twardowski). In 1934 he was appointed an associate professor. In 1946, he was appointed a full professor at the University of Wrocław, where he organized psychological studies and the Chair of Psychology. Since 1953 at the University of Warsaw, where he headed the Chair of Experimental Psychology until the mature exam. Consistent continuator of certain psychological issues of the Lviv-Warsaw school. An advocate of introspection and test methods that include a component of the tested person's consciousness. A critic of existing diagnostic tests. He is the author of the so-called maximum method, i.e. the method of measuring the abilities with the use of the maximum result. Works devoted to the issue of will (will understood as the process of inhibiting an impulse). During the Warsaw period, he was interested in the subject of understanding texts, and he developed a method for studying the subject of understanding texts. Primary works: "Zmienność rezultatów testów", cz. I-II ("Variability of test results", Lviv 1927, 1933), "Kształcenie charakteru" ("Character training", Warsaw 1946), "Podstawy psychologii" ("Basics of psychology", Warszawa 1949), "Rozumienie tekstów" ("Understanding texts", Warsaw 1968).

Fig. 7. Prof. Mieczysław Kreutz (1893-1971), http://psych.uw.edu.pl/o-nas/historia/slawni-profesorowiezasluzeni-pracownicy/mieczyslaw-kreutz/ (12.10.2017).

Janusz Reykowski - professor at the University of Warsaw and head of the Department of Psychophysiology at MIAM in the 1960s and 1970s. Until 1968 a consultant at the Military Institute of Aviation Medicine. From 1967 to 1968, he was also the head of the Feliks Dzierżyński Social Research Center at the Political-Military Academy. From 1980 to 2002 he was a director of the Institute of Psychology of the Polish Academy of Sciences. In 1996, he co-founded the University of Social Sciences and Humanities (SWPS). Since 1984 he has been an honorary member of the Polish Psychological Association, and since 1991 a member of Academia Europea. He has also worked, mainly as a consultant, in numerous foreign scientific institutions, such as: Center for Advance Studies in Behavioral Sciences, Stanford, California, (Fellow 1990-1991), International Society for Study of Behavioral Development: Member of the Executive Committee (1976-1985), European Association of Psychology of Personality: Member of the Executive Committee (1985-1990), International Society of Political Psychology: Member of the Governing Council (1991-1993), President (2004-2006), Altruistic Personality and Prosocial Behavior Institute – Humboldt State University:

Fig. 8. Prof. Janusz Reykowski (1929-), http://psych.pan.pl/pl/pracownia-psychologii-politycznej/janusz-reykowski/ (12.10.2017).

Consultant (1983-), European Center for Research and Documentation in Social Sciences - Vienna Center: Member of the Board of Directors (1991-1993), De L'Academie Europeenne Des Science, Des Arts et Des Letters (Membre Titulaire 2001), Member of Graduate Program in Political Psychology School of Social Sciences, University of California, Irvine (2004). Member of the Polish Academy of Sciences (since 1983), honorary member of the Polish Psychological Association (since 1984) and the Polish Social Psychology Association. The scientific interests of prof. Janusz Reykowski concern the regulatory role of personality in human life and this thematic scope concerned the consultation of MIAM aviation psychologists.

Mieczysław Choynowski - an outstanding psychologist and consultant in the field of psychometrics at MIAM in the 1970s. Philosopher, founder and head of the Psychometric Workshop of the Polish Academy of Sciences (1959-1969). He studied at the Warsaw University and Jagiellonian University. After the war, he edited the magazine "Życie Nauki" for a short period of time in Cracow. In the 1970s, he emigrated to Sweden and then to Mexico. He lectured at the Universidad Pedagógica Nacional in Mexico. In 1963, he developed a memory scale, the so-called Choynowski's memory scale. In 1950-1956 he established and conducted the first modern psychological laboratory in the psychiatric hospital in Kobierzyn near Cracow, which very quickly became a centre of psychodiagnostics methods. In 1956-1970 he organized and conducted the Psychometrical Laboratory of Polish Academy of Sciences in Warsaw. This Laboratory played a very important role in Polish psychological milieu. It built bridges between Polish and western psychologists and between Polish and Central Europe psychologists, independently of political divisions. Thanks to the consultative cooperation of dr. Mieczysław Choynowski, with WIML aviation psychologists and granting access to 20 volumes of Guilford psychometric tests, among which there were several volumes concerning the mental abilities of pilots[2], it was possible to adapt several dozen of "paper-pencil" tests to the examination of several generations of candidates for aviation, included in the so-called "Aviation Tasks". Moreover, dr. Mieczysław Choynowski, before leaving for Mexico, gave Jan Terelak a statistical program (perforated tape for the "Odra" computer, which MIAM had at their disposal at that time), thanks to which the first factor analysis of the structure of temperament in Polish psychology was carried out, using the method of Varimax Kaiser's [34,58] Main Components.

Fig. 9. Mieczysław Choynowski (1909-2001), http://marszalkowska.eu/2013-01-25-nieznane-prace-choynowskiego-w-kwadrydze (12.10.2017).

Dr. Mieczysław Choynowski spent his last thirty years in Mexico City engaged in the development of scientific psychology in Mexico. He died in Mexico at the age of 92, honored by highest scientific awards by Mexican authorities.

Mariusz Maruszewski - psychologist, neuropsychologist, initiator of neuropsychological research in Poland. Consultant at the Military Institute of Aviation Medicine for a very short period in the seventies due to a deadly disease. He studied psychology at the Faculty of Philosophy of the Moscow University in the years 1950-1955. After completing the studies, an assistant at the Chair of General Psychology at the Faculty of Pedagogy of the University of Warsaw. In the years 1958-1959, he completed an internship at the Institute of Neurosurgery under the direction of Aleksander Łurija. PhD degree in 1960 under the supervi-

2 It should be recalled that just before the US started war operations in Europe, Guilford, as a military psychologist, had been appointed the head of a large team of psychometers to construct a battery of psychological tests useful for carrying out a 'quick' selection of military pilot candidates based on his factorial theory of intelligence. For carrying out that task, Guilford received the rank of a general.

Fig. 10. Mariusz Maruszewski (1932-1973), http://psych.uw.edu.pl/o-nas/historia/slawni-profesorowiezasluzeni-pracownicy/mariusz-maruszewski/ (12.10.2017).

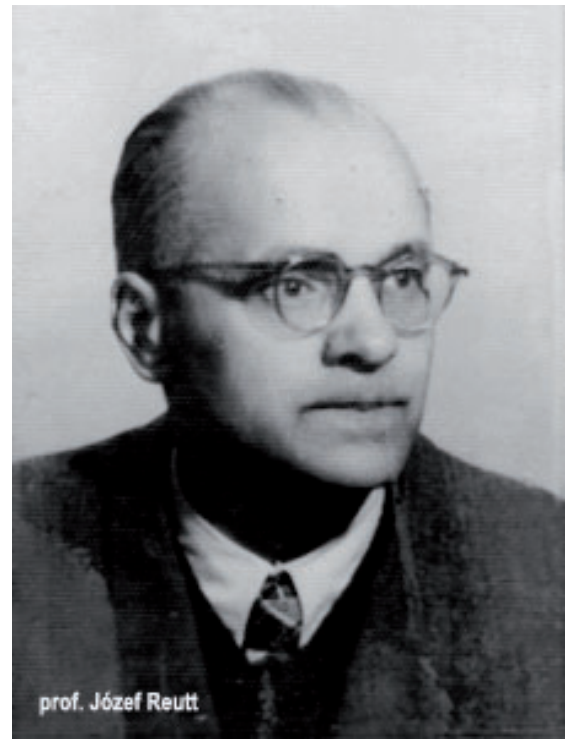

Fig.11. Prof. Józef Reutt (1901-1972), http://www.kul.pl/art_32792.html (12.10.2017).

sion of prof. Tadeusz Tomaszewski. Pioneer in Poland in research on brain mechanisms of speech function and its disorders. Co-founder and head of the Speech Therapy Team at the Department of Neurological Rehabilitation in Konstancin, near Warsaw. Head of the Scientific and Research Team of Neuropsychologists at the University of Warsaw and initiator of the specialization in clinical neuropsychology. He organized the first Clinical Psychology Department in Poland at the Medical University of Warsaw. A number of functions in national and international societies and organizations, including at the Committee on Psychological and Pedagogical Sciences, the U.S. Academy of Aphasia and the Aphasia Research Group at the World Neurology Federation. Main works: "Mowa a mózg" ("Speech and brain") in 1970.

Józef Reutt - Polish psychologist and associate professor at the Catholic University of Lublin and a scientific consultant for aviation psychologists in the 1970s. He studied philosophy at the Stefan Batory University, and then psychology and philosophy at the Sorbonne in France. In 1931, he received his Master's degree at the Vilnius University thanks to his work entitled "Teoria uczuć u Spinozy" ("Spinoza's theory of feelings"), and he defended his PhD thesis entitled "Przedstawienie celu a postępowanie" ("Presentation of purpose and conduct") during the war at the secret University of Western Lands in Warsaw, and then formally in 1945 at the University of Poznań. He was the secretary of the Polish Psychological Association. In 1951, he began his habilitation at the University of Poznań, but he abandoned it by order of the authorities. Since 1954 he was the head of the Psychological Department Team at the Faculty of Christian Philosophy at the Catholic University of Lublin. In the same year, he was appointed the associate professor of this university. Later, he studied psychophysiological issues based on the Pavlov's work and his methods of teaching. In this respect, he conducted consultations with aviation psychologists, who dealt with the role of temperamental traits in the pilot's activity.

Kazimierz Obuchowski - consultant at the Military Institute of Aviation Medicine for a short period in the seventies - an outstanding specialist in emotional psychology, a professor at the Adam Mickiewicz University in Poznań, a would-be head of the Department of Psychophysiology at MIAM, a reviewer of many scientific works by aviation psychologists. Graduate of psychology at the Adam Mickiewicz University in 1956, an outstanding researcher and academic teacher, creator of fundamental theories in the field of personality psychology, clinical psychology and philosophical

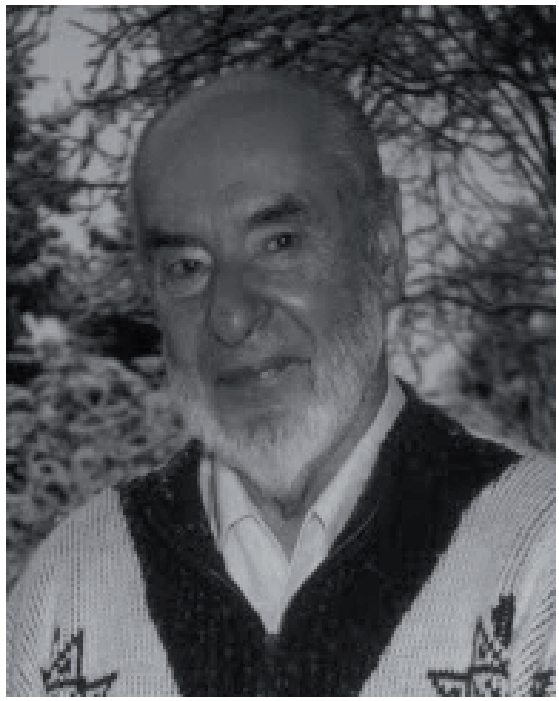

Fig. 12. Prof. Kazimierz Obuchowski (1931-2014), http://uampsych-muzeum.home.amu.edu.pl/kazimierz-obuchowski/ (12.10.2017).

anthropology, an author of monographs important for psychology. He was a long-time employee at the Chief of Clinical Psychology and the Institute of Psychology of the Adam Mickiewicz University, where he headed the Psychological Laboratory of Human Concepts. For many years he was the head of the Department of Personality Psychology at the Institute of Philosophy and Sociology of the Polish Academy of Sciences (a branch in Poznań) and the Institute of Psychology of the Polish Academy of Sciences (a branch in Poznań). He also worked at the Kazimierz Wielki University in Bydgoszcz, where he was the head of the Department of Psychology of Personality. Professor Kazimierz Obuchowski was invited to give lectures at American and European universities.

Jan Strelau - consultant at the Military Institute of Aviation Medicine for a very long period in the eighties and nineties of the twentieth century - a world-famous specialist in the psychology of temperament and intelligence, professor at the University of Warsaw, scientific consultant of the Department of Aviation Psychology for over dozen of years in the seventies and eighties, a promoter of four doctorates in aviation psychology (Janina Maciejczyk, Jan Terelak, Leszek Radomski and Jan Turlejski).

He began his studies at the Catholic University of Lublin, after two years he moved to the University of Warsaw, where he graduated in psychology in 1958. From that time until 2001, he remained a research worker at this university, passing through successive stages of his professional career. In 1963, he received his PhD degree. He habilitated in 1968 on the basis of a dissertation entitled "Temperament i typ układu nerwowego" ("Temperament and type of the nervous system"). In 1976, he received the title of a professor of humanities and took the position of an associate professor. In 1982, he became a full professor. In the years 1978-1981 he was the director of the Institute of Psychology. He was the organizer and later the director (1984-2001) of the first in Poland Chair of Psychology of Individual Differences at the Faculty of Psychology, as well as the founder and the director (1998-2001) of the Interdisciplinary Centre of the Behavioural Genetics.

He was the first President of the European Society for Personal Psychology (1984-1988) and also the president of the International Society for the Psychology of Individual Differences (1993-1995). He held the positions of Vice-President of the International Union of Psychological Sciences (1996-2000) and Vice-President of the Polish Academy of Sciences (2002-2006). He took up editorial positions in scientific journals, i.e. "Polish Psychological Bulletin", "European Psychologist". He was a secretary general and a member of the presidium of the board of the Polish Psychological Association. He is a member of the European Academy of Sciences (Academia Eu-

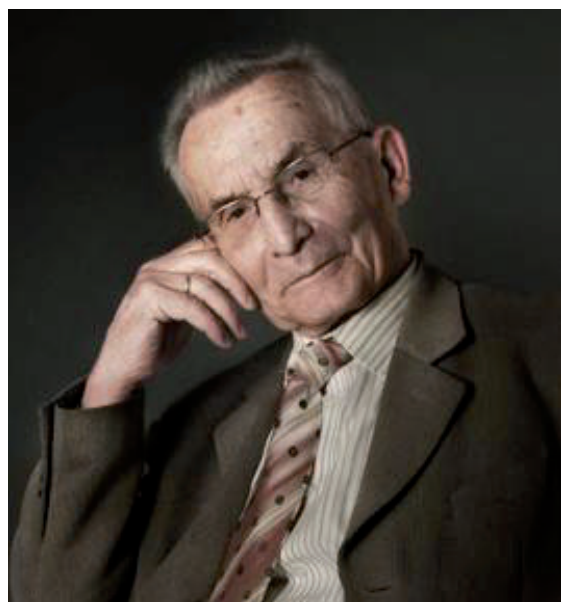

Fig. 13. Prof. Jan Strelau (1931-), http://bw.swps.edu.pl/info/author/IMPORT-PERSON-00002519/Jan+Strelau;jsessionid=E4C39046D3907A7E573F0058A91453F4?lang=en&r=publication&tab=publications&cid=66392 (12.10.2017).

ropaea), a regular member of the Polish Academy of Sciences and a foreign member of the Finnish Academy of Sciences and Literature. In 2001, he moved to the University of Social Sciences and Humanities, where he became the first dean of the Department of Psychology. In 2002, he took the position of Vice-Chancellor for Science and International Cooperation, and in 2010, of Vice-Chancellor for Science, which he held until 2012. Then he became the President of the Board of Trustee at this university.

Jan F. Terelak (1942-) - scientific consultant at MIAM in the years 2008-2018. He was a long-term employee at WIML at the Department of Psychophysiology and later at the Department of Aviation Psychology, holding all the positions from assistant to professor and department manager, and after retirement he was a scientific consultant. He specializes in the following issues: clinical psychology, methodology of psychological research, stress psychology, aviation and space psychology. He provided consulting services in this field in the last years of his work at MIAM. At that time he was also the editor-in-chief of the scientific journal "The Polish Journal of Aviation Medicine and Psychology". More detailed CV can be found in the article presenting all aviation psychologists from the years 1928-2018.

Fig. 14. Prof. Jan F. Terelak (1942-), http://www.wiml.waw.pl/?q=pl/Trzy_sztuki_na_Antarktyce-Terelak (12.10.2017).

CHRONOLOGICAL LIST OF POLISH AVIATION PSYCHOLOGISTS IN THE YEARS 1928-2018

Within the 90 years of the existence of Military Institute of Aviation Medicine, the following names of aviation psychologists should be listed chronologically: dr. Włodzimierz Missiuro, prof. dr. Bohdan Zawadzki, dr. Piotr Macewicz, dr. Knappe, Elżbieta Dębicka, MA, - dr. Stanisław Trębaczkiewicz, Ewa Walewska, MA, Jan Trojanowski, MA, dr. Krystyna Galubińska, Jolanta Walicka, MA, dr. Romuald Błoszczyński, dr. Janina Maciejczyk, dr. Zbigniew Baranowski, dr. Henryk Świątek (pilot), dr. Piotr Pokinko, Andrzej Eliasz, MA, prof. Jan F. Terelak, dr. Leszek Radomski, dr. Kazimierz Migdał, dr. Zdzisław Kobos, dr. Julian Wonicki, dr. Jan Turlejski, dr. Jacek Szczechura, Krystyna Otrocka, MA, dr. Olaf Truszczyński, dr. Tadeusz Jasiński, Tadeusz Sojka, MA, dr. Adam Tarnowski, Lucyna Jaworska, MA, Marta Szlakowska, MA, Alicja Nakonieczna, MA, Mariusz Turek, MA, dr. Marian Macander, dr. Piotr Zieliński, dr. Marcin Biernacki, Magda Bicka–Capała, MA, Marta Górska, MA, Katarzyna Łapkiewicz, MA, Michał Janewicz, MA, dr. Paulina Baran.

TECHNICAL ASSISTANCE

Wiesława Domańska (Strupińska), Janina Szymańska, Ewa Opałka, Teresa Ochalska.

AUTHORS' DECLARATION:

Study Design: Jan F. Terelak; **Data Collection:** Jan F. Terelak; **Manuscript Preparation:** Jan F. Terelak. The Author declares that there is no conflict of interest.

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REMINISCENCES CONCERNING THE ADAPTATION OF MEDICAL REQUIREMENTS AND MEDICAL CERTIFICATION REGULATIONS OF THE MILITARY INSTITUTE OF AVIATION MEDICINE TO INTERNATIONAL AND EUROPEAN AVIATION LAW IN THE PERIOD OF POLISH INTEGRATION WITH THE EUROPEAN UNION

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Abstract: The article presents the reminiscences of the author concerning the adaptation of medical requirements and medical certification regulations in use at the Military Institute of Aviation Medicine to the international and European aviation law, in the process of licensing the aviation personnel of the Polish Air Force and civil aviation personnel, in the period of integration with the European Union. The article emphasizes organizational changes in Main Aero-Medical Commission in order to improve methods of health promotion and prevention of civilization diseases among members of the aviation staff.

Keywords: aviation medical certification in Poland, health promotion, European medical standards

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INTRODUCTION

The article presents the reminiscences of the author concerning the adaptation by the team of Military Institute of Aviation Medicine (MIAM) employees of medical requirements and medical certification regulations to the international and European aviation law, in the process of licensing the aviation personnel of the Polish Air Force and civil aviation personnel, in the period of integration with the European Union. The article emphasizes organizational changes in Main Aero-Medical Commission in order to improve methods of health promotion and prevention of civilization diseases among members of the aviation staff.

Since the beginning of the establishment of the MIAM, its main task were scientific activity, prevention and treatment activity, assessing the capability of military aviation candidates to serve in the air as well as assessing members of military and civil aviation personnel and performing tasks related to the investigation of the causes of air accidents. Prior to Poland's accession to the European Union (EU), certification tasks were performed by Main Aero-Medical Commission (MMAMC) based on Polish medical requirements as well as aviation and medical regulations [1].

The process of Poland's integration into the EU began in 1994 at the moment of Poland's submission of an application for EU membership and its confirmation by the Member States at a conference in Essen, and continued until 2004, when Poland became a full member of the EU. The then authorities of MIAM, the Commander of MIAM col. prof. Krzysztof Kwarecki, Deputy for Scientific Affairs col prof. Krzysztof Klukowski, as well as members of the Scientific Council, undertook multidirectional activities aimed at establishing contacts with EU aviation centers, exchanging experiences and results of scientific research as well as adapting aviation and medical regulations and requirements to NATO and EU standards. Intense scientific contacts with aviation medical institutes in NATO member states were established. Young physicians specializing in aviation medicine working for MIAM have been given the opportunity to study at renowned aviation medical centers around the world (USA, Canada, UK, France). The training in aviation medicine completed with a diploma or certificate from one of the foreign aviation medical centers, was completed by 11 officer physicians from MIAM. At the same time, aviation physicians from MIAM took part in refreshing courses abroad, where current standards of NATO aviation medicine were presented. Establishing direct contacts with aviation medicine physicians has also resulted in the organization of training courses for a wide range of aviation physicians, especially physicians of aviation facilities, by experts from the UK and Canada visiting MIAM.

The management of MIAM, observing the organization of aviation-medical research and certification in NATO and EU countries, stated the need for urgent adjustment of the Polish regulations on certification for aviation staff to European and global standards. In 1995, I was offered the position of Deputy Commander of MIAM for Certification and Chairman of Main Aero-Medical Commission, as well as taking up the task of modernizing the certification and medical activity. Since 1975 I have been working in the Department of Internal Medicine at MIAM, where I gained specialization in internal diseases and cardiology and a PhD degree in medical sciences based on the thesis "Badania adaptacji wysiłkowej układu krążenia u pilotów w warunkach oddychania mieszaniną ubogotlenową z zastosowaniem metod polikardiograficznych" ("Examination of adaptation of the cardiovascular system to physical activity in pilots in the conditions of breathing a mixture with small amount of oxygen using polycardiographic methods"). The decision to take up the offered position was difficult as it entailed the resignation from clinical work. After taking up the position, the Health Promotion and Primary Prevention Center was established at Main Aero-Medical Commission with specialist diagnostic laboratories: cardiology, psychology, musculoskeletal system and urology. Diagnostic laboratories have been equipped with modern diagnostic devices. The particular laboratories were managed by physicians with clinical and aviation medicine specializations.

An important organizational element was the creation of an electronic database at Main Aero-Medical Commission. Since then, each member of the aviation staff has had his own electronic medical certification card, which has greatly facilitated the archiving and access to personal and medical data, especially in the context of the implementation of the health promotion and prevention programme for civilization diseases. The first stage of prevention activities was to improve and adjust to international requirements for the selection of candidates for the Polish Air Force Academy (PAFA) in Dęblin. In 1996, the Health Promotion and Prevention Programme for Civilization Diseases of the Aviation Personnel has been introduced at Main Aero-Medical Commission, which primarily concerned the aviation personnel of the Polish Air Force (PAF), but also included civil aviation

personnel. The health promotion and disease prevention programme for PAF was implemented on the basis of the existing organizational structures in the air force, i.e. on the level of: MIAM, Military Training and Fitness Centres (MTFC) in Zakopane and Mrągowo and in aviation facilities [6].

CENTER FOR PROMOTION AND PRIMARY PREVETION

Based on specialist offices and the laboratory of Main Aero-Medical Commission, the Center for Promotion of Health and Primary Prevention under the leadership col dr hab. med. Krzysztof Mazurek was established, which consisted of diagnostic laboratories of: cardiovascular system (the head: dr. Andrzej Orzeł), psychology (the head: dr. Zdzisław Kobos), urology (the head: dr. Andrzej Modrzewski) and the musculoskeletal system (the head: Tomasz Kozicki, physician). The main tasks of CPHPP included: epidemiological research of aviation personnel, improvement and implementation of the health promotion model, training of aviation physicians, examination of the effectiveness of promotional and preventive activities. The Center's specific tasks included: analyzing the causes of morbidity and inability to perform the profession of aviation personnel, defining priorities for promotional and preventive actions, isolating informal prevention groups (groups with higher risk) from aviation personnel, training of aviation personnel in the field of health promotion. People with an increased risk of disease were referred to use extended medical diagnostics in clinical conditions. Preventive recommendations recorded in the electronic database were communicated to the members of aviation personnel and to the physicians of the aviation facilities concerned. During the preventive and certification examinations, individual advices and educational brochures on low-cholesterol diets, smoking risks, the role of physical activity in disease prevention, etc. were given [5].

Based on the results of research obtained during periodical and occasional medical examinations of the aviation personnel of the Polish Air Force, the following programmes were implemented in CPHPP: (a) cardiovascular disease prevention programme, (b) programmes for the prevention of emotional disorders, musculoskeletal disorders and prostate diseases. The programme of promotion of health and cardiovascular disease prevention, managed by the author of the article, was divided into two tasks: (1) health promotion and cardiovascular disease prevention programme including pilots of supersonic planes (CORO), (2) cardiovascular disease prevention programme including all the remaining aviation personnel (CHOS) [4]. Within the scope of health promotion, the issues of treatment and prevention of diseases of aviation personnel were discussed under the training of aviation medical staff. This subject matter was also included in the programmes of pre-examination courses in aviation medicine and in training courses. Moreover, CPHPP organized seminars for aviation physicians twice a year, during which selected clinical problems of aviation medicine, epidemiological problems of PSP and actions taken for the benefit of health care were presented [3].

CARDIOVASCULAR DISEASE PREVENTION PROGRAMME IMPLEMENTED IN MILITARY TRAINING AND FITNESS CENTERS AND AVIATION FACILITIES

A system of exchange of medical information between MIAM and physicians of the Military Training and Fitness Centres (MTFC) has been introduced. Physicians at MTFC sent to the chairman of Main Military Aviation and Medical Commission (MMAMC) a list of aviation personnel, participants of the recreation and training camp and in turn received data on health indicators of individuals obtained during the last examination at MMAMC, together with preventive recommendations. In accordance with these recommendations, pilots received at MTFC a low cholesterol diet, appropriately selected sets of physical exercises and physiotherapeutic treatment. At the end of the camp, medical check-ups were performed, including performance and fitness tests, the results of which were transferred to the MMAMC computer database [2,7]. Within the framework of preventive tasks carried out in selected aviation facilities (training regiments in Dęblin, Biała Podlaska and Radom), selected working groups of MIAM specialists, consisting of: cardiologist, psychologist, neurologist, urologist, orthopaedist, implemented the following health promotion activities twice a year: (a) lectures on diseases most common at PSP and their prophylaxis, (b) individual medical advice and consultations, (c) discussion of the epidemiological state of the aviation personnel and suggested recommendations with the authorities of the facility, (d) introduction of low calorific diets into the aviation canteens, (e) anthropometric measurements (f) periodical assessment of the energy balance performed by the PE instructor [3,6].

ASSESSING THE EFFECTIVENESS OF THE HEALTH PROMOTION AND PROPHYLAXIS PROGRAMME

Epidemiological research carried out in the first year of the programme's operation showed, among other things, that 70% of the causes of inability to serve in the air at the PSP in the period 1992-1998 were related to three groups of diseases: cardiovascular diseases 35%, neuroses and psychological disorders 20% and overload and pain syndromes of the spine 15%. It has also been shown that the above diseases correspond to the incidence of atherosclerosis risk factors, health risks associated with lifestyles, working conditions as well as ageing process. The level of risk factors for cardiovascular diseases turned out to be high and close to the one of general Polish population. On this basis, priority directions of preventive actions were established, covering: cardiovascular diseases, neuroses and emotional disorders, spine diseases and prostate diseases. One of the important prophylactic issues turned out to be prostate diseases. About 50-60% of men aged 45-50 were proven to have benign prostatic hyperplasia. The programme of urological prophylaxis covered the PSP in age groups over 45 and members of civil aviation personnel performing tests in CML MIAM, and in the above activities a leading physician was dr. Andrzej Modrzewski [9,10].

The assumptions of the health promotion and disease prevention programmes were presented at many scientific conferences in Poland and abroad. Detailed information on the effectiveness of promotional and preventive activities carried out at Main Military Aviation and Medical Commission (MMAMC) can be found in the monograph by col. dr. Krzysztof Mazurek [4].

ADJUSTMENT OF THE CERTIFICATION PROVISIONS OF THE MILITARY AVIATION PERSONNEL WITH NATO STANDARDS

Representatives of MIAM systematically participated in meetings of NATO working groups preparing medical standards for military pilots (standards agreements - STANAGS). In accordance with these requirements, the following were introduced in the process of selecting candidates for Polish Air Force Academy: the assessment of aviation predisposition of candidates using aircraft simulators, training of military pilots in aircraft simulators and training in selected issues of aviation medicine. Training on simulators included: overload centrifuge training, spatial orientation training on HIPERION simulator, simulated flights on JAPETUS simulator and catapulting training. In accordance with requirements of NATO, search and rescue teams were established, trained in providing first aid to the victims of air accidents [6].

ADAPTATION OF EUROPEAN CIVIL MEDICAL AND CERTIFICATION REQUIREMENTS FOR USE IN POLAND

In 1990, the European Civil Aviation Commission (ECAC) established the Joint Aviation Authority (JAA), which developed European medical requirements for licensing of civil aviation personnel (Joint Aviation Requirements Flight Crew Personel - JAR FCL), published in 1997. In 2003, an executive organization of the European Union, the European Aviation Safety Agency (EASA), was established and took over the certification responsibilities of civil aviation personnel from the JAA.

On July 3, 2002, the Aviation Law Act was passed in Poland, a legal act adapting Polish licensing regulations to the EU regulations [11]. A medical certificate issued by one of the EASA member state remains valid in other EU member states. Pursuant to the Aviation Law, the Civil Aviation Authority (ULC) - the aviation authority responsible for complete supervision over the civil aviation in the country was established. The Chief Medical Officer was responsible for the organization and supervision of certification and medical examinations in Poland.

Certified medical examiners and Centers for Aviation Medicine were authorized to perform medical certification examinations. The Center for Aviation Medicine (CML) was established at MIAM, headed by dr med. Marian Pawlik. CML is currently carrying out medical and certification tasks on the basis of the amended European regulations Part - MED, issued in 2013. The following posted MIAM personnel took systematic and direct part in the work on the development and implementation of common European certification requirements for civil aviation: dr. Krzysztof Mazurek, physician Edward Wielgołaski, dr. Mariusz Żebrowski, dr. Marian Pawlik, dr. Tomasz Setny, physician Robert Powierża [8].

AUTHORS' DECLARATION:

Study Design: Krzysztof Mazurek; **Data Collection:** Krzysztof Mazurek; **Manuscript Preparation:** Krzysztof Mazurek. The Author declares that there is no conflict of interest.

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COOPERATION OF AVIATION PSYCHOLOGISTS IN THE MILITARY INSTITUTE OF AVIATION MEDICINE AND IN THE MILITARY AVIATION AND MEDICAL COMMISSION AT THE MILITARY AVIATION HOSPITAL IN DĘBLIN

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Source of support: Own sources

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Abstract: The author, working in the field of psychological certification first at the Military Aviation and Medical Commission in Dęblin and then at the Main Military Aviation and Medical Commission at Military Institute of Aviation Medicine in Warsaw, is characterized by the specificity of the work of aviation psychologists, methods of examination of psychophysical fitness of military aviation candidates and selection of pilots during their service.

Keywords: methods of selection of military pilots, medical certification in the field of mental state of pilots

Figure: 1 • **References:** 12 • **Full-text PDF:** http://www.pjambp.com • **Copyright** © 2017 Polish Aviation Medicine Society, ul. Krasińskiego 54/56, 01-755 Warsaw, license WIML • **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education

INTRODUCTION

Creation of the stationary aviation psychological certification center in Dęblin was possible thanks to the establishment on April 4, 1957 by Order No. 4 of the Chief of General Staff of the Polish Army, Garrison Military Aviation Hospital in Dęblin, which changed its name many times (Military Aviation Hospital, 6th Military Hospital, 6th Military Aviation Hospital). Initially, it had only three departments: of internal diseases, surgery and obstetrics, as well as a freelance polyclinic with an x-ray office and a laboratory. Its task was to provide medical care to the staff, families, officer cadets and soldiers of the Air Force Academy in Dęblin.

In 1961, the Military Aviation and Medical Commission (MAMC) in Dęblin was established, within the structures of the Military Aviation Hospital (MAH), to carry out preliminary examinations of candidates for aviation schools and to conduct annual periodical examinations of cadets and officer cadets. In order to guarantee the full-profile examinations for the above mentioned people, in 1965 a Psychological Laboratory was set up in MAH and a Low Pressure Vehicle Chamber was brought in (http://www.szpitaldeblin.pl/historia-zakladu). This Psychological Laboratory carried out research for the benefit of MAH, and was organizationally subordinate to the Commander of the Military Aviation Hospital, who was directly subordinate to the Head of Health Service of the Air Force in Poznań.

APPLICATION OF PSYCHOLOGICAL KNOWLEDGE IN AVIATION AND PSYCHOLOGICAL CERTIFICATION

Initially, the laboratory had no permanent staff, and preliminary and periodical examinations were performed by officers-psychologists from the Military Institute of Aviation Medicine (dr. Piotr Pokinko, dr. Jan Terelak, dr. Henryk Świątek) who arrived to Dęblin alternately for weekly stays. The first full-time psychologist in the years 1972-1973 at the MAH in Dęblin was Czesław Modzelewski, MA, and after he left in 1974, Emilia Gromisz, MA (a graduate of the Catholic University of Lublin) was employed. Another manager of the Psychological Laboratory in 1975 was the recipient of the scholarship of the Ministry of Defense, 2nd lieutenant Leszek Radomski, MA, and at the same time a psychological researcher, Janina Szymańska, was employed. On May 23, 1980, dr. Zdzisław Kobos (a graduate of the Jagiellonian University) joined the laboratory as a deputy manager. In the following years, the tasks and staff structure were expanded, and the laboratory was visited by 2nd lieutenant Marian Macander, MA (a graduate of psychology studies at the University of Łódź and a graduate of military training at the Military Medical Academy in Łódź). Later, the Psychological Laboratory employed Halina Wieraszka, MA (a graduate of the University of Warsaw), and a psychological laboratory worker - Barbara Sułek. The new tasks concerned psychological consultations for Military Aviation Hospital in Dęblin clinical wards (laryngology, internal medicine, surgery, ophthalmology) and for hospital clinics. At that time, the lab employed another graduates of psychology in Łódź: 2nd lieutenant Marek Komasiński, MA, and lieutenant Cezary Grabowski, MA. The main tasks of the team of psychologists, however, were psychological examinations of the candidates for military schools, i.e: Air Force Academy (AFA) and Aviation High School (AHS) in Dęblin, Aviation High School in Zielona Góra, Air Force Academy for Non-Commissioned Officers in Dęblin, School for Warrant Officers of the Aviation Personnel (Technical Air Force School) in Zamość and the Central Training Center for Air Force Technical Specialists (Technical Air Force School) in Oleśnica Śląska and the School for Warrant Air Force Officers in Dęblin, School for Junior Specialists in Dęblin.

ACTIVITIES OF AVIATION PSYCHOLOGISTS FOR THE BENEFIT OF THEORETICAL AND PRACTICAL AVIATION TRAINING PROVIDERS

After moving to MIAM on 4.03.1984, cpt. Leszek Radomski, MA, the offer of psychological effects on the aviation environment related to practical training in the air was expanded. Namely, cooperation was established, among others, thanks to the initiative of inspector of the WOSL headquarters, colonel pil. Franciszek Pajnowski, with the School Headquarters and with the school regiments of this school. As part of their duties, officer-psychologists assessed psychological predisposition to study at AFA, not only in laboratory conditions of the psychological laboratory, but also during flights on planes and gliders during training camps of the so-called Air Military Training (AMT of the 1st and 2nd degree). At that time, the practical learning of piloting on Zlin planes (42, 142), carried out in Polish Aeroklubs in the localities: Olsztyn (Dajtki), Toruń (Lisie Kąty), Częstochowa (Rudniki), Kielce (Masłów), Radom (Osola), Łódź, Piotrków Trybunalski, Ostrów Wielkopolski (Michałków), Mielec (Chorzelów), Nowy Targ, Krosno. In order to be simultaneously present in so many centers

of aviation trainings, and to compare the results of psychological research with the progress in basic aviation training on an ongoing basis, an An-2 aircraft with a crew of 23 AFA School Squadron was assigned to the disposal of a psychologist officer. On the basis of the empirical data obtained from the training in AMT (from civilian instructor-pilots, on the progress in particular stages of training of candidates for aviation), officer-psychologists have prepared forecasts of the psychological professional usefulness of particular candidates for the Recruitment Committee, which they were members of, and presented their opinions during the discussion on eligibility for studies at AJA. Psychological opinions and forecasts were an important element of the recruitment procedure, as there were a lot of people willing to study in aviation schools. At that time, between 2,000 and 5,000 people applied to the Military Aviation and Medical Commission (MAMC) in Dęblin for research.

Moreover, in addition to the selection tests mentioned above, officer-psychologists carried out tasks related to participation in various projects in the field of applied aviation psychology. Namely, at first cpt. Zdzisław Kobos, MA, later 2nd lieutenant Marian Macander, MA, were also consultants for:

1. Organizers of the theoretical training process (AFA Training Department).
2. Pilot-instructors of school regiments providing practical training in the air.
3. They took part in the meetings of the Flight Hygiene and Safety Teams of the school aviation regiments located all over the country.
4. They participated in the teaching staff meetings at aviation schools.

Moreover, Psychological Officers regularly, several times a year, flew to the AFA school regiments: Biała Podlaska, Nowy Glinik, Babimost, Nowe Miasto nad Pilicą, Radom, Modlin, Goleniów and often visited the local airport in Dęblin. In these school regiments, officer-psychologists provided training for pilot-instructors and practical aviation training organizers.

At this stage, cooperation with the above mentioned school regiments was established, among others, in the field of effectiveness of practical training of officer cadets of subsequent years of studies, on military aircraft. This cooperation included the following stages.

1. Preparation of "Preliminary psychological characteristics" of particular officer cadets, which were presented in aviation regiments to instructors-pilots educating individual pilots-students before the commencement of training in the air.
2. Creation, together with pilots-instructors, of "Progress cards in aviation training", during initial training of pilots-students carrying out subsequent stages of aviation missions.
3. Development, in cooperation with the instructor-pilot, of the "Aviation psychological characteristics" of individual officer cadets on individual aircraft, following the completion of training in a given school regiment, with an estimate for further stages of specialist training [4].

Psychologist-officers attached great importance to their research, e.g. by checking the diagnostic accuracy of the applied methods and their usefulness in professional selection procedures. Namely, they performed the so-called local standards annually in relation to all the analyzed professional specialties occurring in aviation schools [5].

The psychological research conducted, its importance and significance for the selection assessment procedures and the effectiveness of education in the "School of Eagles" were appreciated by the then Commander of the Military Aviation Hospital (MAH) col. dr. Jan Borek and other AFA commanders. The results of the psychological examinations of the candidates were of interest to, among others, gen. pil. Józef Kowalski. His successor, on the other hand, at the position of AFA Commander, aviator-cosmonaut gen. pil. Mirosław Hermaszewski often visited the Psychological Laboratory in person, asking psychologists about his officer cadets, who caused didactic or disciplinary problems. The AFA Commander gen. pil. M. Hermaszewski also met with a psychologist at airports, because he was interested in the progress of cadets during aviation training. Usually he arrived for the final 2nd degree Air Military Training (AMT) exams, exchanging his comments with a psychologist and the training staff about the candidates to AFA, who were currently operating their own flights, passing this stage of practical training.

It should be emphasized that thanks to the understanding of the significance, specificity and importance of psychological research for aviation by the then Head of Medical Supply of the AMT col. Jan Krygrowski, MA, the Psychological Laboratory in Dęblin was equipped with the most modern diagnostic methods available on the market at that time, even those which were not available at psychology departments at universities.

For example, in 1985 the Psychological Laboratory of the Military Aviation Hospital in Dęblin had a Hungarian mobile system for psychophysiological research, which was used for field research at airports. Furthermore, this laboratory had a computer version of the *Eysenck Personality Inventory (MPI*

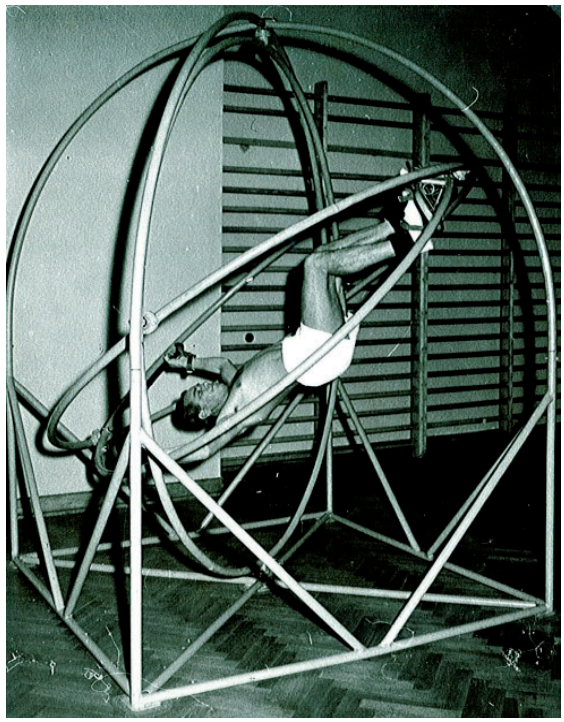

Fig.1. Psychological research of spatial orientation conducted on aerial air instruments.

) Test implemented for the Atari computers, and a few years later it was equipped with a set of psychological tests implemented for IBM computers, the most modern in Europe. These were ten workstations operating in the local Novell network with central control. This computer system of psychological tests, the so-called "Warsaw Test System" [1], was designed by the employees of MIAM, i.e. the then Head of the Department of Aviation Psychophysiology, prof. Jan F. Terelak, with the participation of dr. Kazimierz Migdał and dr. Zdzisław Kobos, MA. While the software of the system was developed by dr. Marek Cieciura, with the help of dr. Włodzimierz Kuzak from MIAM, and lieutenant Sławomir Panasiuk, MSc. Eng. and lieutenant Robert Bielewski, MSc. Eng. - graduates from the Military University of Technology. One of these systems of computer-based psychological diagnostics, i.e. the Warsaw Test System, was installed in the Psychological Laboratory of the Main Military Aviation and Medical Commission of the Military Institute of Aviation Medicine, headed by major Zdzisław Kobos, MA.

PSYCHOLOGICAL ACTIVITY IN AVIATION AND MEDICAL COMMITTES

Psychological activity in aviation and medical committees can be reduced to the few following areas. The first area concerned the professional selection of military and civilian pilots within the framework of aviation and medical certification, under which psychologists had full autonomy in diagnosing cognitive, psychomotor and personality processes, formulated from the perspective of flight safety.

The second important area of activity was participation in committees for the investigation of air accidents and catastrophes. Aviation officers-psychologists were appointed annually, by order of the Chief of General Staff, to the Committee for Investigation of Aviation Accidents of the Ministry of National Defense and the Air Force Command with the rights of a member. As part of this activity, they were on so-called accident stand duty all year round with an order to report to the airport within two hours of being notified by the MIAM on-duty service. It should be added that in those years there was no mobile communication, and the message usually arrived through the assistant of the MIAM officer on duty. Only when "pagers" appeared did they facilitate fast communication. It should be added at this point that a psychologist, after completing the analysis of the cause of the accident or catastrophe caused by the pilot's error or the so-called human factor (e.g. flight organization), analyzed these causes in the entire state of flying personnel from all aviation units. Aviation psychologists were also invited to the annual Conferences on the Safety of Air Forces Flights (and National Air Defense) to present papers on psychological conditions of flight safety. Such a paper was delivered, at the invitation of the Commander of the Air Force gen. Lech Majewski, by prof. dr. Jan F. Terelak, on "Assertiveness in military aviation", during the 51st Conference on Aviation Safety of the Polish Armed Forces, after the dramatic crash of the transport plane "Casa C-295 M", no. 019"[1].

Last but not least, the third important aspect of the activity of MIAM aviation psychologists concerned consultations and didactics in aviation units and training and fitness centers in Mrągowo and Gronik near Zakopane. Psychological counseling provided to pilots in their parent military facilities during study and consultation visits with frequency every six months. On the basis of the information obtained, ad hoc activities (e.g. organizational, personal) were undertaken and

1 The disaster took place on January 23, 2008, at 19:07, during the attempt to land at the military airport of the 12th Aviation Base in Mirosławiec. The plane was transporting officers of the Air Force participating in the 50th Conference on Aviation Safety of the Polish Armed Forces, to their aviation units. During the landing attempt, the crew unexpectedly led to excessive tilting of the aircraft, causing a progressive decrease in the lifting force, which led in the final phase of the flight to a sudden descent with the loss of direction and a collision of the aircraft with the ground. As a result of the plane hitting the ground, all the people on board were killed on the spot - 4 crew members and 16 passengers.

long-term plans were formulated in the form of preventive actions and/or scientific research programmes aimed at solving significant psychological problems in the field of flight safety. There were also frequent meetings with airmen family organizations and a variety of topics on how to cope with daily stress events were addressed. Moreover, such meetings served as guidelines for the modification of the certification regulations and organizational and training instructions, and were the source of knowledge obtained from pilots-flight instructors about current difficulties in training of personnel of a specific facility of the air force.

Moreover, the tasks of MIAM psychologists included scientific activities covering, among others: basic laboratory and application research often conducted in aviation units [2,6,8], active participation in scientific conferences in Poland and abroad [9,10,11,12], and training in aviation psychology for physicians specializing in aviation medicine or for military family organizations [3,7].

AUTHORS' DECLARATION:

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INFORMATION TECHNOLOGY AT THE MILITARY INSTITUTE OF AVIATION MEDICINE FROM 1980 TO 1995

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Source of support: Own sources

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Abstract: Author, retired colonel, MD Engineer, in the years 1980-1995 head of the Department of Medical Information Technology at the Military Institute of Aviation Medicine and the Chief Specialist of the Military Health Service in the field of Medical Information Technology, pre-sents the designed and implemented IT systems in Polish aviation medicine as well as the effects and plans of further computerization.

Keywords: medical information technology, implementation effects of medical information technology at the Military Institute of Aviation Technology

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Fig.1. Presentation of the MIAM's certification system (from the left: author, colonel doc. Zbigniew Sarol, colonel prof. Stanisław Barański - Commandant of MIAM, colonel prof. Krzysztof Kwarecki - Deputy Commandant of MIAM, delegate of the American Army, and lieutenant colonel dr. Jerzy Achimowicz).

The Military Institute of Aviation Medicine (MIAM) is a military health care institution which started to use IT methods and means as early as in the 1960s. Natural changes in the scope of methods used and in the use of increasingly modern computer equipment occurred during this period.

At the beginning of the 1980s, the main computer at MIAM was the Odra 1304 computer. It was replaced by one of the first in the Polish Army two SM-4 type minicomputers, whose terminals were installed in various units of the Institute. Microcomputers of IBM PC type, which are usually integral parts of examination support systems, were gradually put into operation. Gradually, these microcomputers were coupled with central minicomputers.

SYSTEMS SUPPORTING CERTIFICATION ACTIVITY

First of all, the systems supporting the certification process of the Central Military Aviation and Medical Commission (CMAMC) in the scope of military and civilian flying personnel were designed. They were developed in a modular structure, which made it easier to make the required modifications, changes and additions.

In CMAMC systems, the results of daytime certification were entered on the basis of a medical examination card and additional test results from the terminals installed at the CMAMC receptions. Apart from the tests carried out by CMAMC, information on hospital stays, ailments diagnosed there, possible referrals for further treatment in sanatoria, and on exemptions from work activities granted was also recorded. Every day, immediately after the data entry was completed, the daily report was prepared and the databases were updated. The systems significantly relieved the CMAMC units of the burden of developing time-consuming and laborious reports on health of military and civilian flying personnel.

The collected results of specialist and additional examinations enabled current analysis of health condition and forecasting of drop out rate of flying personnel. The obtained conclusions were used in prevention, human resources and training activities, as well as in the course of certification and scientific research activities MIAM[1].

1 The author of the article and his team were awarded the Second Degree Team Prize in Military Medicine on 12 October 1988 by the Minister of National Defense for the development of systems supporting the certification and medical activities of aviation medicine.

The results of the flying personnel's examinations were available from the terminals installed in the offices of MIAM Commandant and CMAMC Chairman. Access to information was provided based on the conversational software on the basis of an index or name given from the terminal (if it concerned a single person) or on the basis of values of parameters defining a group of persons. It was possible to immediately make a list selected from among several dozen prepared beforehand. The personal data of individual flying personnel members recorded in these systems were available in other systems through the use of a unique personal index.

SPECIALISED SYSTEMS

The first of the developed specialist systems included the results physical fitness tests of the military flying personnel conducted in the Military Training and Fitness Centers (MTFC). It was used, among other things, to assess physical fitness, set standards and refer pilots to MTFC. Data in this system were entered periodically in the IT Department after receiving source documents from MTFC. These consisted of the results of physical fitness tests and the assessment of physical fitness. In the course of information processing, the system used information collected in systems supporting certification activity.

A large number of those examined in CMAMC specialist surgeries and a large amount of medical information, as well as a need for in-depth analysis of data, evaluation of treatment effectiveness and quick access to selected information, created premises for commencing work on computerization of three surgeries: cardiology, endoscopy and dentistry.

The cardiology surgery support system collected, processed and made available the results of cardiovascular examinations in pilots observed for: cardiac rhythm and conduction disorders, suspicion of coronary artery disease. The system recorded data from history, physical examination, resting and exercise ECG examination, 24-hour ECG monitoring and other specialist cardiovascular examinations (echocardiography), effects of pharmacological treatment.

The endoscopy surgery support system collected, processed and made available the results of stomach and duodenum examinations in patients with or at risk of ulcer disease. The system recorded data from the history, results of endoscopic examinations, method and results of pharmacological treatment.

The system supporting the dental office collected, processed and made available data on the condition of teeth and periodontium for all military flying personnel. This system enabled individual and group analysis of the dynamics of changes in the dental condition and provided guidelines for taking preventive measures. Ultimately, the first two systems were to be consultation and review systems.

TRACING SYSTEMS

The first of the implemented systems was used to assess exercise capacity in dynamic conditions on a moving raceway or cycloergometer. A whole range of physiological indicators were recorded there. It was possible to conduct physical training in accordance with a previously developed program with simultaneous control of the frequency of heart contractions, eliminating the possibility of overloading the cardiovascular system. The first version of the system was developed on the basis of a mini-computer MERA-400, and the next one on the basis of a microprocessor technology.

Subsequent very important systems supported examinations in aeromedical simulators: low-pressure chambers and a High-G centrifuge. Different physiological parameters were measured and analyzed during the examination. In particular, the systems did not allow for critical situations in the test organisms. These systems were based on IBM PC microcomputers.

MEASUREMENT AND INFORMATION SYSTEMS

The first example of systems in this class is the system for testing the equilibrium organ using posturography method. The initial version of the system was developed on the basis of the mini-computer MERA-400. Later a version based on IBM PC was created.

Another example was the system for the assessment of physical fitness of the pilot's system in variable flight conditions, consisting of a measurement part and an evaluation system.

The system supporting neurological diagnostics and supervision was also developed using modern topographic methods. The system was implemented on the basis of IBM PC microcomputer and put into service. The use of the system allowed for the assessment of brain function, measured by its bioelectric activity. The system allowed not only to obtain data on the momentary state of the patient, but also to analyze and record

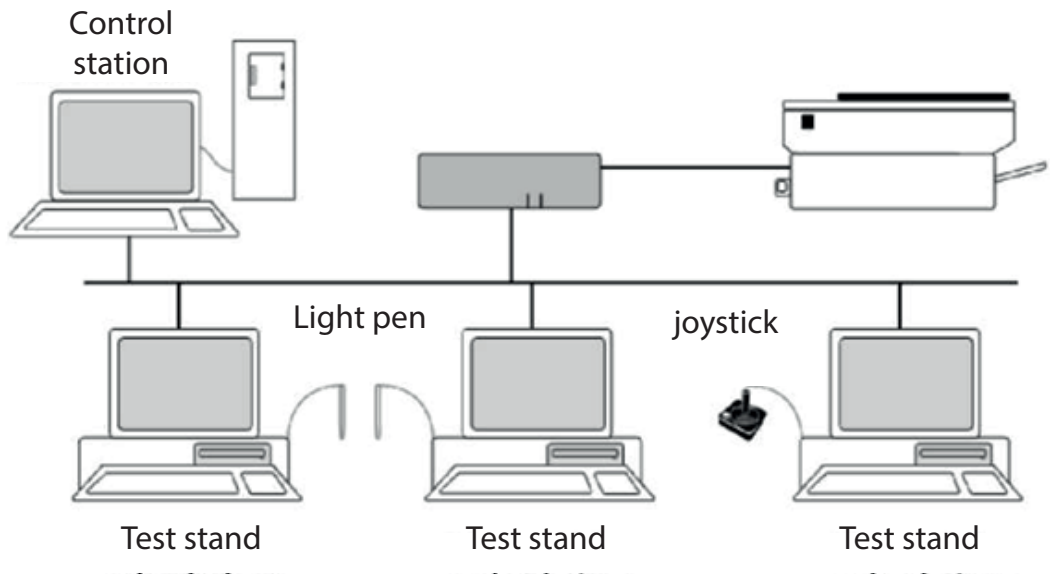

Fig. 2. Hardware base for group psychological examination system.

changes in his/her condition over long periods of time. The information in the system was organized in the form of a hierarchical database, which allowed easy access to all the results and allowed to perform various analyses. Other systems concerned chronophysiology and included:

- use of the frequency of heart contractions to assess the physical and mental strain on the body, including shift work (day and night), and the load on the body during real flight and simulation tasks,
- analysis of ECG record morphology in stressful situations.

The basis for the analysis was the record of 24-hour ECG signal by means of MEDILOG system, directly connected to the IBM PC type computer.

PC/XT computers with color monitors, light pens and joysticks. Another system developed was an integrated system of psychophysiological tests, designed for routine group psychological tests and research work in the field of clinical psychology[2]. It was based on the D-Link network with a PC/AT computer as a control station, where the scope and sequence of research was planned. Several test stands were based on PC/XT computers with color monitors, light pens and joysticks. PC/XT computers with color monitors, light pens and joysticks.

Several psychological tests were implemented in the system (from questionnaires to apparatus tests – with time parameters measurement), including, among others:

1) Numerical tables. Test of perceptual efficiency in terms of function: perceptual speed, divisibility of attention, operating memory, as well as visual and motor coordination.
2) Bourdon test. Attention divisibility and concentration, visual tracking speed test.
3) Kraepelin arithmetic test. Work pace and mental capacity as well as fatigue in monotonous conditions test.
4) Simple Response Time. Measurement of the simple reaction time (SRT), i.e. the time needed to start the motor response act when the stimulus is detected.
5) Choice Reaction Time. The Choice Reaction Time (CRT) is the time it takes to perceive a stimulus, identify it and decide on the choice of an appropriate motor response to the stimulus.
6) Cross Test - Sight and Movement Coordination. The test of general psychomotor performance covering such functions as: visual and motor coordination, perceptiveness, concentration and attention shifting, as well as fatigue resistance.
7) Piórkowski's Test - of sight and Movement Coordination. Measurement of the speed of a psychomotor response at an imposed or free rate, in terms of perceptiveness and divisibility of attention, and in terms of visual and motor coordination.
8) Perception - Spatial Relations Test. Examining spatial imagination and reasoning on spatial forms.

The system had the following functions:

- ordering tests – the function was used to assign to a test stand a test or a set of tests, to determine the parameters for the test (e.g. test

2 The concept of the system was developed by prof. Jan Terelak and the author of this article.

duration, work rate) and to enter or read from the personal database the personal data of the person undergoing tests,
- review of results – the possibility to run another test on individual stands after the operator has viewed the results of the current test or without doing so was created,
- review of tasks – preview of the status of tests at individual stands,
- database review – a review of the results of previous tests with the possibility of printing them out,
- printout manager – printing the results of completed tests on an ongoing basis without "disrupting" ongoing tests, i.e. in multi-tasking and multi-use mode,
- generation of standards – generating new standards on the basis of the collected test results. To this end, the system required at least 100 test results. This function could also been used to print out the entered or calculated standards. Newly calculated standards became mandatory after the acceptance of the system operator,
- creating a set /battery/ of tests – creation of specific test suites.

An important function of the system was to measure selected physiological indicators (pulse, breath, skin resistance), which were correlated with the results of psychological tests. This enabled research to be carried out into, among other things, stress factors.

HOSPITAL SYSTEM

The computerization of MIAM Hospital started in 1992. All the software for the system was developed by the MIAM Department of Computer Science in Fox-Pro database language. This made it possible to make the necessary changes and corrections on an ongoing basis and to extend the functions in direct contact with the users. It also created the possibility of direct operation of the software being developed under the Unix operating system.

The system was designed with the following objectives in mind:
- enabling direct management of diagnostic and therapeutic processes, ensuring, among other things, shortening the time of patients' stay in hospital, as a result of the acceleration of information flow and reduction of the impact of bottlenecks, occurring, among others, in specialist diagnostic laboratories. An important element was the attempt to automate the treatment costs assessment and to automate reporting,
- shorten the time spent by doctors and nurses on preparing medical records (each piece of information is entered only once with the possibility of its repeated use) with simultaneous forcing of order, regularity and unification in keeping medical records and reducing their quantity and fragmentation,
- implement automatic updating of the dispersed database on the course of diagnostic and therapeutic processes and their effectiveness. Elements of this database were to be used directly in scientific and research works conducted at MIAM.

The hardware base of the hospital system was the Novell network of IBM PCs with a PC 386 server. The installation of the network required the laying of transmission and power supply cables, the total length of which amounted to almost 2 km.

Workstations were installed, or the possibility of installing them was ensured, in all hospital units: Admission Unit, Nurse Stations, Medical Rooms, Diagnostic Labs, Clinical Laboratories, Radiology Department, Hospital Pharmacy and Medical Statistics Department.

4 layers were distinguished in the system: "Patients Flow", "Patient Care", "Diagnostics" and "Therapy". They included modules such as "Clinic" or "Clinical Laboratory", at selected workstations, e.g. within the "Clinic" module: "Nurse Station" and "Clinic Physician Room".

Since 1 January 1993, the "Patients Flow" layer has been operated at the MIAM Hospital 24 hours a day, supplied with information from the workstations of the "Admission Unit" and "Nurse Station" in all 5 clinics, providing data to the "Medical Statistics Department" station. It should be mentioned that prior to the implementation of the "Patients Flow" module, each future user received 8-hour training, both in the basics of computer use and in the rules of using the developed software. The software was then put into trial operation.

"Clinic Physician Room" workstation

The software developed for this station enabling:
- history taking (review of systems) and physical examination,
- ordering pharmacological treatment (data were transferred automatically to the appropriate Nurse Station),
- ordering tests to the Clinical Laboratory and the Radiology Department,

– automatic recording of the results of tests performed in the Clinical Laboratory and Radiology Department,
– printing of necessary documents (e.g. "Medical Case Record", "Discharge Summary", prescriptions, sick leave forms),
– making specific compilations, for example in the form of contingency tables for a flexibly defined set of patients.

"Clinical Laboratory" module

It enabled computer-aided:
– registration of orders for outpatient tests,
– registration of orders for hospital tests,
– registration and segregation of samples,
manual entering of test results to the local database,
– automatic entering of the results of tests carried out with the use of analyzers to the local database,
– formal and substantive verification of test results,
– transmission of the results of the clinic's tests,
– printing of the results of outpatient tests and specific results of hospital tests,
– carrying out compilations and statistical calculations.

Notable should be in-house development of software and hardware solutions, enabling the results of tests carried out with the help of the SERONO-BAKE 9000 hematology analyzer and the CEBA-CORNING biochemical analyzer to be automatically entered in the local database.

"Radiology Department" Module

The described module was used on 4 workstations, installed in the Department Reception, Ultrasonography Laboratory, X-ray Room, X-ray Consulting Room and enabled to perform the following functions:
– registration of orders for outpatient tests,
– planning of tests dates,
– registration of tests execution,
– describing the results of tests,
– printing of registers,
– carrying out quantitative statements.

Automated statistical analysis package

A conversational and automated CMS statistical inference package was developed in two versions: for IBM PC microcomputer and for SM-4 minicomputer. The package consisted of a number of related programs in the object form and a library of subprograms.

The package made it possible for researchers to carry out calculations directly by automatically selecting the right statistical methods on the basis of automatically verified conditions[3].

So far, the operation of the developed system has shown its relatively high versatility. It was an effective tool in scientific and research work, significantly shortening the time and increasing the accuracy of statistical analysis of results of medical examinations and experiments.

RECAPITULATION

The IT support for MIAM activities, developed until 1995, confirmed the usefulness of IT methods and means, as well as identified the growing demand for their use.

It should be noted that the use of IT improved the diagnosis and treatment of flying personnel, enabled comprehensive data analysis, shortened the time of access to information and enabled proper data storage and security. It was not without significance that the reporting and recording units were relieved of the burden of time-consuming and laborious compilations and reporting. It was planned to extend storage in the examination results sets instead of aggregated specialist assessments and to adapt source documents to the requirements imposed by computerization.

As part of the further development of IT, it was planned to:
– provide computer support for the most active certification and medical processes,
– expand tests support systems,
– establish a uniform certification and diagnostic activities support system,
– ensure direct, continuous and natural access to all registered certification and medical information.

Comprehensive work was also planned aimed at developing mathematical models of the processes of changes in the health condition of flying personnel and the correctness and effectiveness of the conducted certification, diagnostic and therapeutic activities. A significant problem awaiting a comprehensive solution was forecasting the drop out rate of pilots.

3 For developing a conversational CMS package, the author of the article and his team were awarded the Third Degree Team Prize in military medicine on 12 October 1985 by the Minister of National Defense.

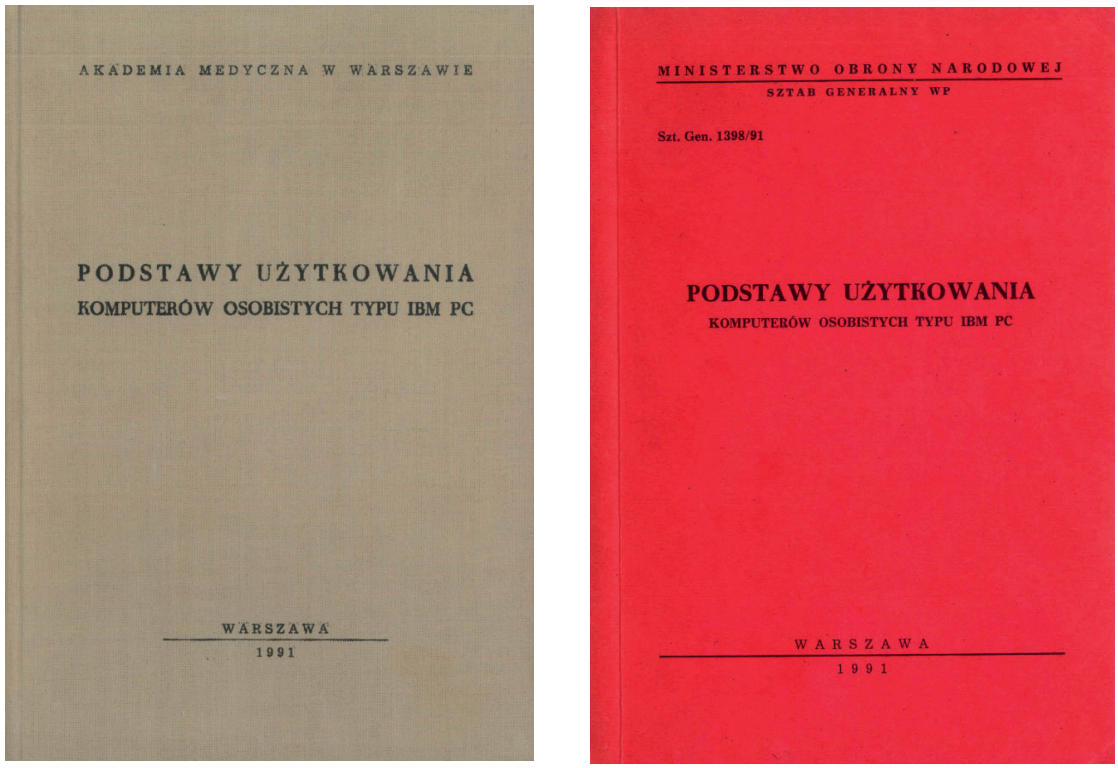

Fig. 3. Textbooks published under the editorship of the author of the article.

Calculation of the results of admission examinations to the Medical Academies

Since 1986, under a contract awarded by the Minister of Health, WIML's Department of Computer Science was calculating the results of admission examinations to all 12 Medical Academies.

This was a high-risk undertaking due to the need to ensure the possibility of loading the answers written in pencil on the response cards - there were no scanners at that time. This was done with the use of a perforated card reader after the installation of additional prisms and the modification of the reader electronics.

The developed technology was in use for several years and was appreciated in a letter dated 18 July 1990 by the Director of the Department of the Ministry of Health and Social Welfare, dr. n. med. Rafał Niżankowski, which included, among others, such statements: "reliable technical and organizational preparation of the process of computer calculation of test results of admission examinations to medical academies" and "an extremely responsible undertaking was carried out in an efficient and timely manner".

Developing a IBM PC User's Guide

The high level of professional knowledge and skills of the employees of the MIAM Department of Computer Science enabled, at the initiative of the author of this article and with his participation and editing, the development and publication in 1991 of the first Polish textbook "Podstawy użytkowania komputerów osobistych typu IBM PC" (Basics of using IBM PCs).

The textbook was first published at the Medical Academy in Warsaw, and then by the General Staff of the Polish Armed Forces - signature: Szt. Gen.1398/914[4].

Commemoration of Home Army soldiers - MIAM employees

On 6 April 2016 during a ceremonial meeting of the Scientific Council held at the Military Institute of Aviation Medicine, soldiers of the Home Army, employees of MIAM[5], were honored.

All participants of the ceremony received a specially prepared and published book "Żołnierze Armii Krajowej – pracownicy MIAM" containing 15 biographies. These biographies are also available on the website: http://armiakrajowa.org.pl/tabliczki/198.html.

4 The textbook was recommended for use in the Armed Forces of the Polish Army by the Deputy Chief of the General Staff of the Polish Armed Forces gen. bryg. Henryk Andracki. In February 1992, the authors of the textbook were awarded with diplomas by the 14th General Staff Head, who stated that the textbook has "a high substantive value and a high practical value".

5 http://armiakrajowa.org.pl/452-uroczysto-w-wojskowym-instytucie-medycyny-lotniczej.

Fig.4. Decorating MIAM employees with "Merit for the World Association of Home Army Soldiers" decorations (from the left: author of the article, prof. Leszek Żukowski, colonel at rest. prof. Eugeniusz Sokołowski and colonel at rest. mgr Stefan Laube).

Professor Leszek Żukowski, President of the World Association of Home Army Soldiers, presented the decorations "For merits to the World Association of Home Army Soldiers" to two living Home Army soldiers - employees of MIAM and to the families of the two deceased soldiers, as well as to the Military Institute of Aviation Medicine.

At the end of the ceremony, a previously handed over plaque with a QR code with the address of the website written down was unveiled by last living Home Army soldiers, former WIML employees – colonel at rest mgr Stefan Laube and colonel at rest. prof. Eugeniusz Sokołowski.

After the plaque was unveiled, the QR code was scanned and the participants of the ceremony could see the content of the site with biographies on a large screen.

AUTHORS' DECLARATION:

Study Design: Marek Cieciura; **Data Collection:** Marek Cieciura; **Manuscript Preparation:** Marek Cieciura. The Author declares that there is no conflict of interest.

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Pol J Aviat Med Bioeng Psychol 2017; 23(3-4):106-107
DOI: 10.13174/pjambp.20.12.2018.15

ONE OF THE BIOGRAPHIES OF AN AVIATION PHYSICIAN WORKING AT THE MILITARY INSTITUTE OF AVIATION MEDICINE

Witold BEDNARSKI

Source of support: Own sources

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Abstract: The author presents a short story connected with working as an air doctor in a military unit and as a researcher in the Military Institute of Aviation Medicine in Warsaw in the Department of Aviation Safety. He also presents the procedures of examination of the anatomopathologist participating in the work of the commissions investigating air accidents and catastrophes.

Keywords: flight safety, aeronautical anatomopathology, investigation of air accidents and catastrophes

I graduated from the Military Medical Academy in 1975 at the Faculty of Medicine with diploma number 1890. After a postgraduate internship, I was referred to the 34th Air Defense Division of the Country (OPK) Fighter Regiment in Gdynia as the Head of the Outpatient Department. In 1981 I started working at the Military Institute of Aviation Medicine (MIAM) in Warsaw as a senior assistant at the Institute of Flight Hygiene and Safety. The Department conducted scientific research related to the hygiene of flying and technical personnel concerning occupational hygiene, nutrition, uniforms, aeronautical toxicology, the impact of microwave radiation on the human body, as well as the causes of air accidents from the point of view of aviation medicine. MIAM set up a medical subcommittee for the Air Accident Investigation Committee (AAIC) of the Ministry of National Defense, where I worked for over 20 years as a specialist in forensic medicine. The medical subcommittee consisted of an aviation doctor, an aviation psychologist and a forensic specialist. I provided judicial and medical expert opinions based on the decision of the Air Force Prosecutor's Office. My tasks in AAIC included: determination of mechanisms and directions of traumatizing forces generated at the moment of collision of the plane with the ground, the possibility of fire and high temperature's impact on the pilot's body during the flight, as well as the assessment of the pilot's health, because the disease changes could result in a loss of consciousness and an air crash. Toxic factors (e.g. carbon monoxide, alcohol) and psychoactive agents were tested in biological material taken from the pilot. In my scientific activity I dealt with air and sea rescue. Many times I participated in scientific and training conferences in Poland and abroad, where I presented scientific papers. I dissolved the service relationship with the Ministry of National Defense in 2002.

AUTHORS' DECLARATION:

Study Design: Witold Bednarski; **Data Collection:** Witold Bednarski; **Manuscript Preparation:** Witold Bednarski. The Author declares that there is no conflict of interest.

Cite this article as: Bednarski W. One of The Biographies of an Aviation Physician Working at The Military Institute of Aviation Medicine. Pol J Aviat Med Bioeng Psychol 2017; 23(3-4): 106-107. DOI: 10.13174/pjambp.20.12.2018.15

Pol J Aviat Med Bioeng Psychol 2017; 23(3-4):108-113

THE POLISH JOURNAL OF AVIATION MEDICINE, BIOENGINEERING AND PSYCHOLOGY

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Body text (Introduction, Methods, Results, Discussion, Conclusions, Acknowledgements, Glossary and References);

Introduction should contain the hypothesis and specific aim of the study or (in case of a review) purpose of the article. Authors should briefly introduce the problem, particularly emphasizing the level of knowledge about the problem at the beginning of the investigation.

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Conclusions should be linked with the goals of the study. State new hypotheses when warranted. Include recommendations when appropriate. Unqualified statements and conclusions not completely supported by the obtained data should be avoided.

Acknowledgements. List all contributors who do not meet the criteria for authorship, such as technical assistants, writing assistants or head of department who provided only general support. Describe their role. Financial and other material support should be disclosed and acknowledged.

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Standard journal article

Gaździńska A, Kłossowski M. Ocena wpływu wybranych czynników żywieniowych oraz aktywności fizycznej na występowanie nadwagi i otyłości u wojskowego personelu latającego. Pol Przegl Med Lotn 2006; 12(2):125-135.

Article with published erratum

Koffler D, Reidenberg MM. Antibodies to nuclear antigens in patients treated with procainamide or acetylprocainamide [published erratum appears in N Engl J Med 1979;302:322-5]. N Engl J Med 1979; 301:1382-5.

Article in electronic form

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Cancer in South Africa [editorial]. S Afr Med J 1994;84:15.

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Lazarus RS, Folkman S. Stress, appraisal and coping. New York: Springer Publishing Co.; 1984.

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Charzewska J, Wajszczyk B, Chabrom E, Rogalska-Niedźwiedź M. Aktywność fizyczna w Polsce w rożnych grupach według wieku i płci. In: Jarosz M, ed. Otyłość, żywienie, aktywność fizyczna i zdrowie Polaków. Warszawa: Instytut Żywności i Żywienia; 2006:317-339.

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Bengtsson S, Solheim BG. Enforcement of data protection, privacy and security in medical informatics. In: Lun KC, Degoulet P, Piemme TE, Rienhoff O, eds. MEDINFO 92. Proceedings of the 7th World Congress on Medical Informatics; 1992 Sep 6-10; Geneva, Switzerland.

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