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# RADIOLOGICAL EXAMINATION OF THE SPINE AND FITNESS FOR WORK AS A HELICOPTER PILOT

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16. Abstract

On the matter of spinal fitness for piloting, standards are proposed that suit the critical spinal segments proper to different jobs. Involved here are primarily pilots of combat airplanes and of helicopters. Fitness for one of these does not necessarily mean fitness for the other.

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# RADIOLOGICAL EXAMINATION OF THE SPINE AND FITNESS FOR WORK AS A HELICOPTER PILOT

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/34-1*

In 1971 [3], we proposed the definition of a specific standard of fitness for admission to employment as a helicopter pilot. We believed that specific fitness conditions must correspond to the specific problems of this job. For various reasons, this project was not entirely retained.

## 1. Current Data on the Problem of Lumbalgia in Helicopter Pilots

Years have passed. New models of equipment have come into use. Lumbalgia in helicopter pilots still exists, as is shown by two studies inspired by R.P. Delahaye and R. Auffret [1,2].

In 1974, C. Colleau [2] reported the results of a study of pilots at the Lanveoc-Poulmic Aeronaval Base. He clearly shows the influence of the type of mission on the appearance of lumbalgia. He insists on the harmfulness, from this point of view, of P.A. Rescue missions with helicopter winches that require flights; the vibrations engendered by the helicopter are especially severe.

In 1977 Vicens [1] reported the conclusions from the clinical and radiological observation of a small series of flight personnel. Involved here were the personnel of a rotary-wing section of the Bretigny sur Orge Flight Testing Center. These are highly qualified, motivated and trained personnel.

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* Numbers in the margin indicate pagination in the foreign text.

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## 2. Character of Lumbalgia

Its origin is due on the one hand to the piloting position and on the other hand to the vibrations engendered by the helicopter.

Clinical examination shows that these cases of lumbalgia have a variable intensity, which runs from simple discomfort to serious pain. They evolve in a chronic form, interspersed or not with sharp stabbing pains appearing during or after flight. These pains are connected to piloting a helicopter. No pilot experienced such symptoms in airplane flight. This kind of lumbalgia begins to appear after 1000 - 1500 hours of flight (Colleau, Vicens), an interval longer than that in the old statistics (Sliodsberg, [4]), 300 - 500 hours. These intervals vary according to the individual, and decrease in pilots who have pre-existing spinal anomalies (transitional lumbosacral anomalies in particular).

After these intervals until appearance, the flight rhythms corresponding to the appearance or continuation of the painful phenomena average 30 to 40 hours per month, 3 to 4 hours a day, 1 hour 30 minutes in continuous flight. These thresholds decrease for missions in stationary flight or at low speeds.

## 3. Prophylaxis for Helicopter Pilot Lumbalgia

takes place at several levels:

-- during the designing of the helicopter, it involves the search for a better filtration of vibrations. The seats must provide a position which approaches Wisner-Swearingen's angles of comfort. The use of automatic stabilizers and the automatic pilot improves piloting conditions.

-- during the use of equipment in formation, it is possible to imagine a duty plan for pilots in flight, below the threshold at which lumbalgia appears.

-- the flight surgeon plays an important role in the medical monitoring and education of flight personnel. He intervenes as a command counselor for questions of health rules, sports practice and the scope of the flight duty.

-- the adoption of a particular fitness standard for admission for helicopter pilots would make it possible to screen candidates and eliminate those who prove to be most fragile in all statistics.

## 4. Admission Standard for Helicopter Pilots /34-2

The development of this standard requires the definition of the critical spinal segment.

The critical spinal segment. The clinical and physiopathological arguments are significant. The lumbar spine and lumbosacral hinge joint are the main constituents of the specific critical segment for helicopter piloting. By contrast, for combat aircraft pilots, the critical spinal segment is different: here the dorsal spine and the dorsolumbar hinge joint constitute the essential most sensitive segments during ejection. In fact, it is largely here that vertebral lesions (primarily fractures) are observed after ejection.

Since the critical segments are different, one cannot conceive a shared standard of fitness for these two jobs (combat plane pilot, helicopter pilot).

## 5. Standard of Fitness for Helicopter Pilots

Fit are: candidates in whom clinical and radiological examinations do not reveal static, morphological anomalies capable of rendering the critical segment fragile (the lumbosacral hinge joint and the lumbar spine). Thus, there are shared causes of unfitness for combat airplane pilots and helicopter pilots, and causes of unfitness which are specific to each of these jobs.

## 6. Shared Causes of Unfitness

These are: evolutive conditions (Pott's disease, melitococcosis, ankylotic spondylarthritis).

The sequelae of fractures other than anterior cuneiform fracture-compressions without adjacent discal lesions.

Troubles of the vertebral statics in the frontal plane when scoliosis reaches an angle greater than 15°.

Complex congenital anomalies (pedicular or articular agenesis, hypogenesis of the vertebral corpus, etc.).

## 7. Causes of Unfitness Specific to Helicopter Piloting

This is essentially the existence of a transitional lumbosacral anomaly, if it is accompanied by a disembedding of the new pivot vertebra or hinge joint.

If this vertebra projects outside the horizontal line joining the upper edges of the two iliac crests, it is disembedded. Under these conditions, this pivot vertebra, which is mobile but secured to the pelvis, will encourage straining of the new hinge-joint disc.

Here there is a predisposition of this disc towards all traumatic or microtraumatic degenerative lesions.

The existence of transverso-sacral neoarticulations, which are frequently the seat of degenerative lesions (Schmorl and Junghans), is a cause for unfitness.

This is also the case in asymmetrical malformations of the lumbosacral hinge joint, which moreover often have an underlying repercussion.

The bilateral isthmic lysis of a lumbar vertebra, generally L5

or L4, with spondylolisthesis, which is a cause for the adjacent disc to become fragile, would also be a cause for unfitness.

Sequelae of juvenile epiphysosis (Scheuermann's disease) do not entail unfitness unless they involve the lumbar segment with cuneiform morphological modifications, and marked irregularities of the vertebral plateaus, reaching several vertebrae. These aspects occur very rarely at the level of the lumbar spine.

It is necessary to insist on the requirement of good spinal musculature.

## 8. Causes of Unfitness Specific to Combat Airplane Piloting

Transitional lumbosacral anomalies, isthmic lyses without spondylolisthesis, are compatible with this job. Sequelae of juvenile epiphysosis, which are responsible for an accentuation of physiological dorsal cyphosis, deformation of the anterior corner of the vertebral corpus, and marked irregularities of the plateaus, reaching several vertebrae, entail unfitness.

In sum, given the different critical spinal segment for helicopter pilots (lumbosacral) and combat airplane pilots (dorsolumbar and dorsal), it is logical to plan the use of different fitness standards for these two jobs.

We will not treat the problem of transport aircraft pilots, for whom the tolerances on the issue of spinal fitness seem to us to be very wide.

## 9. Conclusion

On the matter of spinal fitness for piloting, we propose standards that suit the critical spinal segments proper to different jobs. Involved here are primarily pilots of combat airplanes and of helicopters. Fitness for one of these does not necessarily mean fitness for the other.

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