



DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD  
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MEMORANDUM FOR HEADQUARTERS AIR FORCE SAFETY CENTER  
(ATTENTION: SEW)

SUBJECT: Structural Robustness of Earth-Covered-Magazines (ECMs) in Block A at Volkel AB (Netherlands)

References: (a) E-Mail, Maj. John Tillman (USAFE) to DDESB, "7-Bar Requirements", 3 February 1999

(b) E-Mail, MSgt Don Burns (HQ USAFE/SEW) to DDESB, "7-Bar Igloo Evaluation", 9 February 1999

(c) Selected Drawings for Volkel AB (including attachments) provided to DDESB by USAFE, 2 February 1999

(d) TNO Prins Maurits Laboratorium Memorandum, Mr. Doormaal, "What is the Classification of Magazines at Volkel?", 12 March 1999

As requested in references (a) and (b), Earth-Covered-Magazines (ECMs) in Block A (reference (c)) at Volkel AB (Netherlands) have been examined to determine if they qualify as 7-Bar ECMs. Mr. Doormaal of The Netherlands Organization for Applied Scientific Research (TNO) Prins Maurits Laboratorium compared/evaluated the ECMs in question with US, 7-Bar designs (33-15-74 and Type 16) provided to TNO by DDESB. Material in references (a), (b), and (d) are included here as Attachments A, B, and C.

The ECMs in Block A qualify as 7-Bar magazines. These magazines and any of equivalent design may be sited as 7-Bar ECMs for DoD explosives safety applications.

Insufficient information is available at this time to decide the strengths of magazines in Blocks B and C.

Point of contact is Dr. Chester E. Canada, DDESB-KT1 at DSN: 221-1369 or Commercial: 703-325-1369, or e-mail: canadce@hqda.army.mil.

*/S/ Col Daniel T. Tompkins*

DANIEL T. TOMPKINS  
Colonel, USAF  
Chairman

Attachments  
As stated

cc: w/atchs  
HQ USAFE/SE  
HQ USAFE/LGW  
HQ USAFE/IG

*j/canada/action/vokel ECM*

**E-Mail Message (9 February 1999)**  
**from**  
**Major John Tillman, Chief, Explosives Safety (USAFE)**

Dr Canada,

We are still awaiting the drawings from Incirlik to send you for determination of the type of igloo. We are currently siting another location where the same question has come up. We are in the process of getting the diagrams and definitive drawing numbers. I know we spoke over the phone what characteristics you look for when making that determination. What, specifically, do you look at to determine how much an igloo can withstand?

Door thickness?

What thickness would be OK for a 7-Bar?

Headwall thickness

What thickness would be OK for a 7-Bar?

Your assistance in this matter is greatly appreciated.

**E-Mail Message (9 February 1999)  
from  
MSgt Don Burns (HQ USAFE/SEW)**

Dr. Canada,

Good morning. I just wanted to let you know that two members of the USAFE staff (SMSgt Brit Ellis and MSgt Dave Works) are flying into Washington D.C. today and are planning to stop in to see you during their trip. They have building drawings from Volkel Air Base, Royal Netherlands Air Force (RNLAF) that require your technical review. If it is not too much to ask, would you please evaluate the following:

- A) three types of RNLAF igloo drawings and formally classify them as 7 or 3-bar igloos;
- B) a plan to build a new maintenance and inspection (M&I) facility in close proximity to 4 igloos.

The first request is pretty straightforward. The second request is not so simple and needs a little more explanation. The Dutch are planning to build a new M&I facility that does not meet IM distance to 4 surrounding igloos. Luckily, the USAFE explosive site planning team identified early in the construction stage the fact that the project has the potential to negatively impact two WS3 vaulted aircraft shelters. The Dutch are willing to relocate the new building if expert analysis can show them that the current location is less than optimum. SMSgt Ellis will be able to give you more details on the spot. Please let me know if you anything else from me and I'll work it from here. Thanks you for all your help,

## ECM Comparison/Evaluation by TNO

And the stiffness of the door is proportional to  $\frac{I}{d \cdot L^3}$ .

It can be seen that the doors in the Volkel magazines have a higher stiffness and a higher strength than the doors in the 7-bar igloos.

### Conclusion:

The doors of the Volkel magazines are stronger than necessary for a 7 bar door. Based on these doors, it can be concluded that the magazines can be classified as at least 7 bar igloos.

### References:

- [1] 6 Drawings of magazines at Volkel  
Besteknr. 141.6361.31  
Rangnr: B77060, B77061, B77042, B77044, B77045, B77046
- [2] Drawings of 7 bar magazines  
Drawingnr 33-15-74