

Railway Accident at Great Belt Bridge

January 2th 2019



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Accident Investigation Board Denmark

AIB Denmark

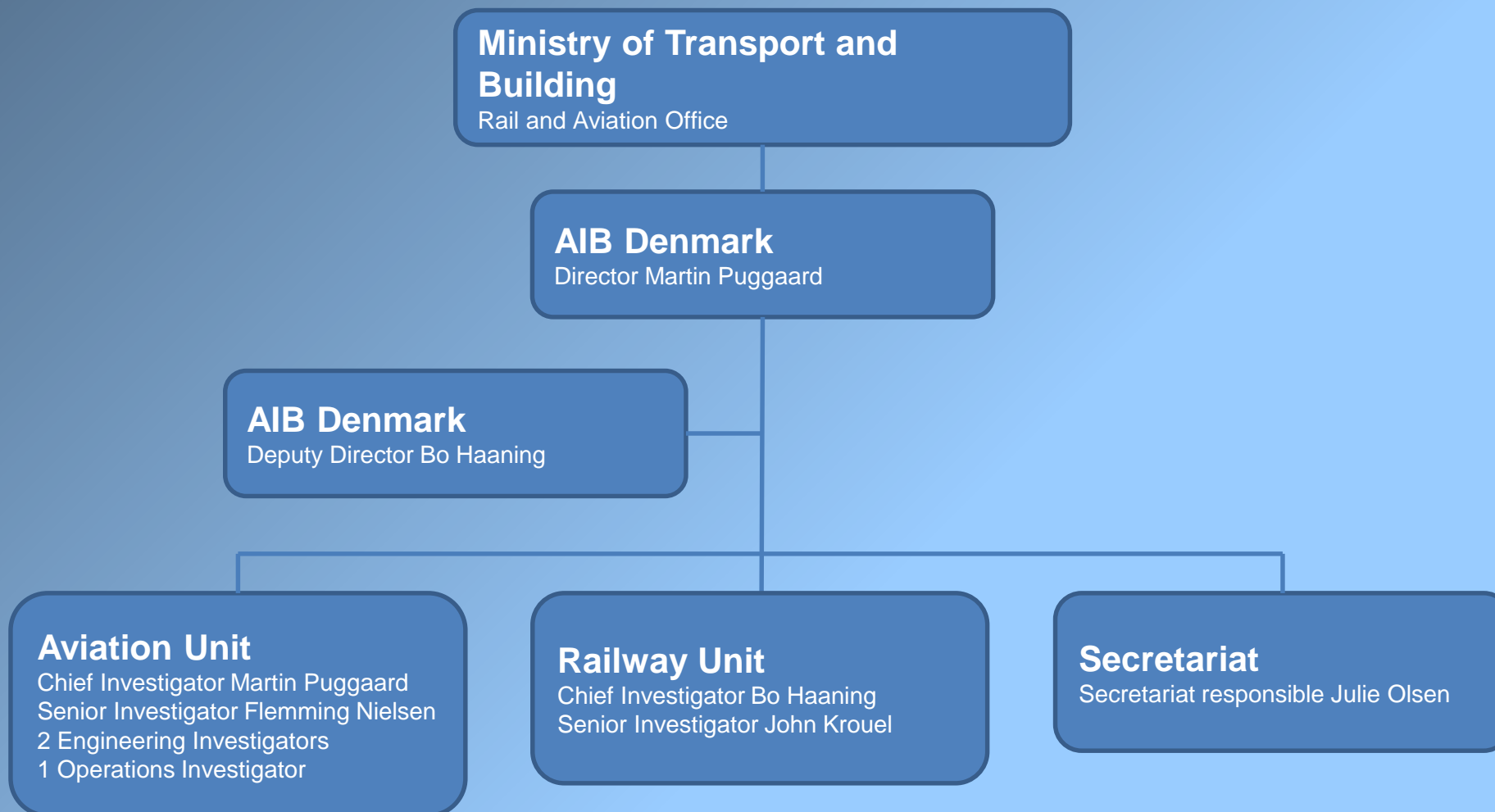
The Great Belt accident January 2th 2019

- What happened January 2th?
- The first days.
- Internal organisation / - multimodal (duo-) work and assistance from other NIBs.
- Preliminary report / status.
- ERA Task Force (JNS TF)
- Further investigations / right now

Questions



Accident Investigation Board Denmark (AIB DK), January 1th 2019



After reduction of staff in April 1st 2017

Total:	8
Aviation Investigators:	5
Railway Investigators:	2
Administrative staff:	1



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Accident Investigation Board Denmark (AIB DK), January 1th 2019

After reduction in staff (April 1st 2017).

Some of the changes / consequences:

24 hours on-call in Aviation and the 24 hours on-call in Rail was been joined together.

Back up from the “other” unit, which e.g. means one from each unit has to be in Denmark in the future.

“Attending on-call” from other unit in all holidays, and agreement of the possibility to do a “lifeline call” between the units.

Local education (cross of the units) and assisting tools has been made.

Expanded use of external resources.

Focus on our obligations (article 19.1 => new 20.1), not on wishes / expectation.



Accident Investigation Board Denmark (AIB DK), January 1th 2019

This has of course been challenged and exciting, but also a success, and it works very well – which you can hear about, when I tell about Great Belt accident.

All employees at AIB DK were involved in the first weeks, and 2 aviation investigators are still involved in several sub investigations.

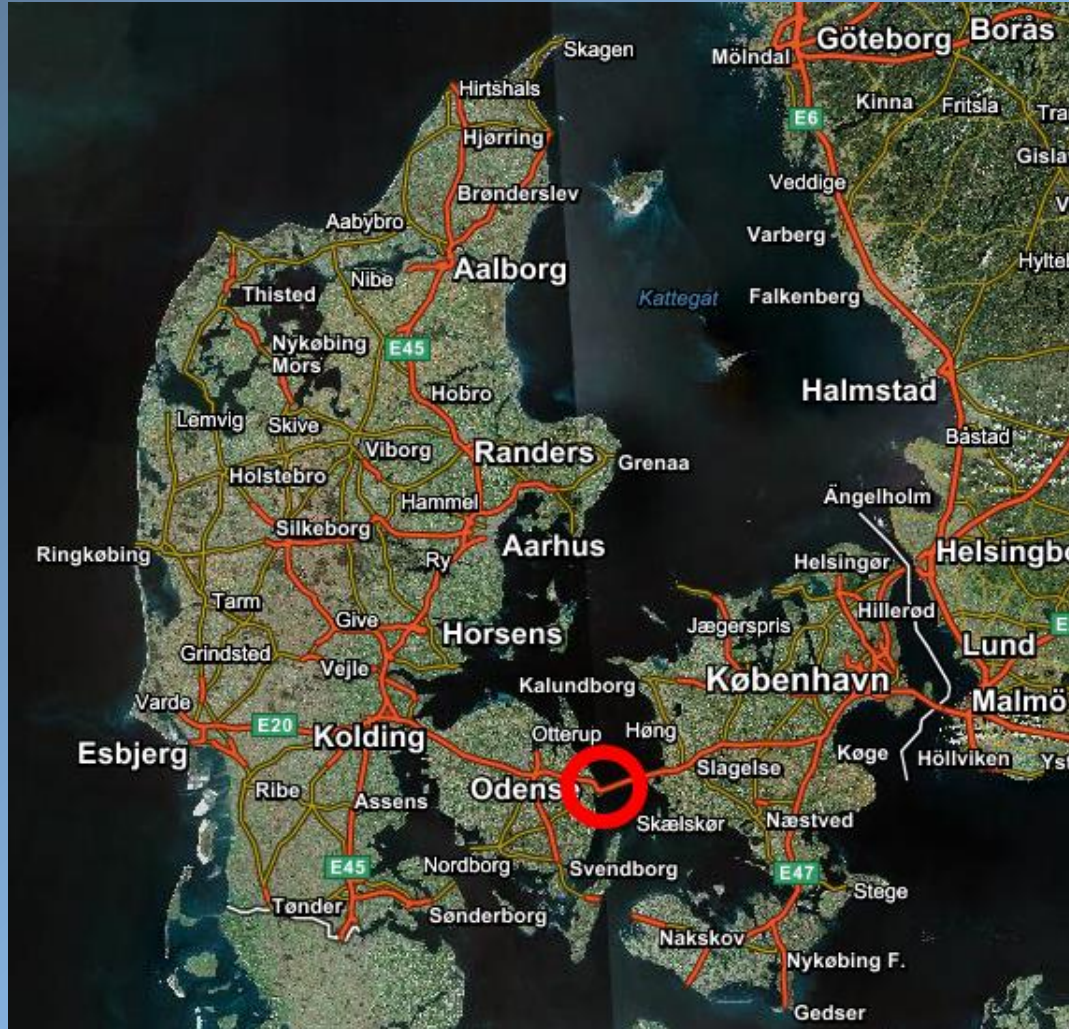
- where railway experience is not essential!



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The Great Belt accident January 2th 2019



Limitations: the investigation is still ongoing, and I can't tell about the final result.



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January 2th 2019 - where



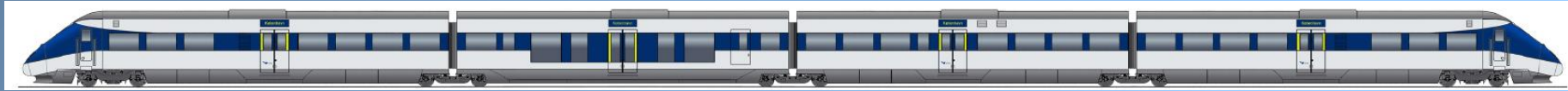
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January 2th 2019 – what (main points only)

Because of a storm the Great Belt bridge was closed for road traffic.

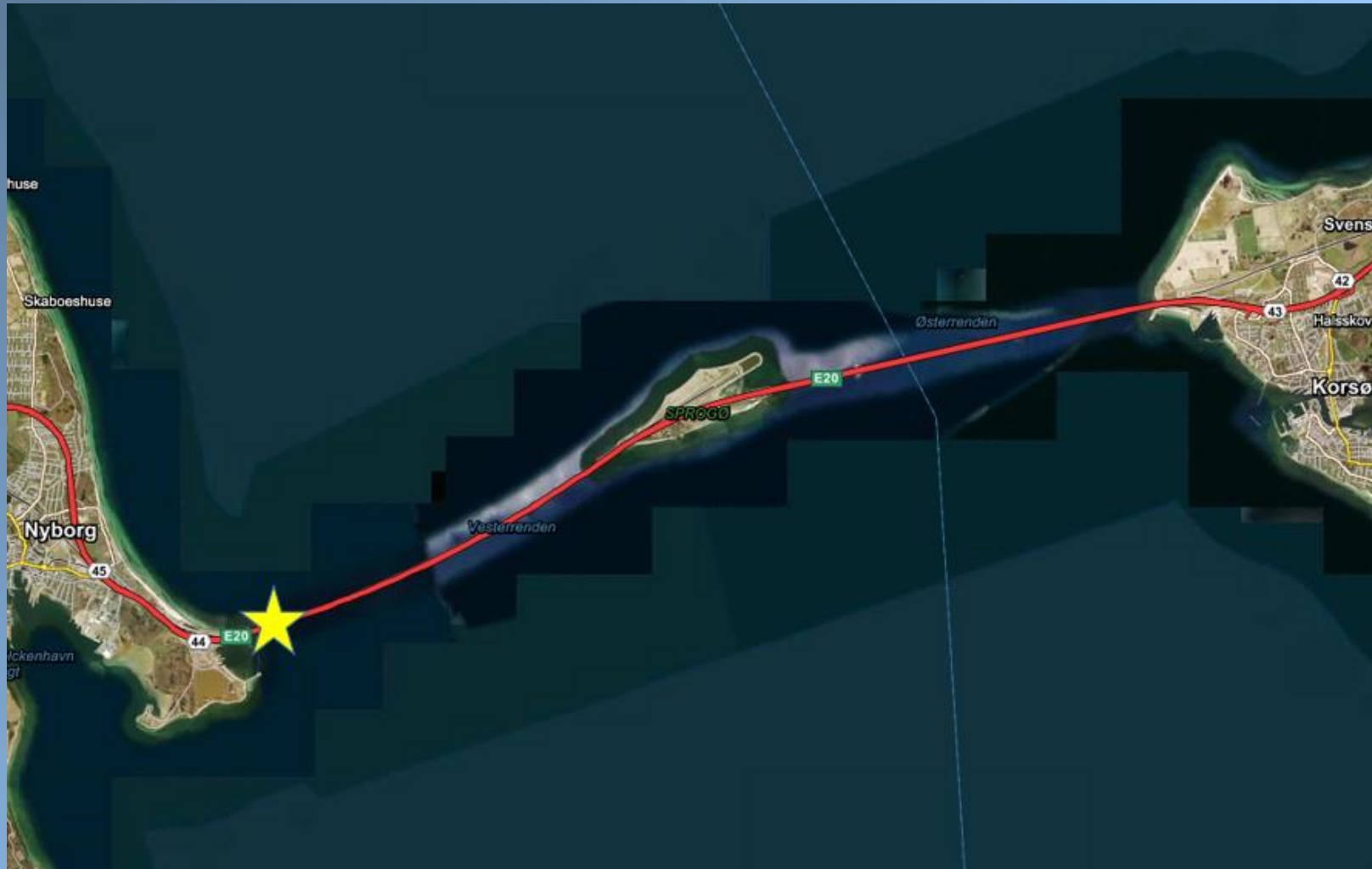
- 07:26:35 Lyn 210 departure from Nyborg Station eastbound (2 IC4 Trainset).



- 07:20 Freight train G 9233 entered the western bridge (from Sprogø) towards Funen (BR185 locomotive, 8 (double) pocket waggons type Sdggmrs).
- The speed of L 210 was 121 km/h - and the speed of G 9233 was 119 km/h.
- There was strong / heavy wind (average wind about 21,5 m/s, peaks were higher).
- The wind direction was North – South => across the bridge.
- Shortly before the end / start of the low bridge (brofæste) the two trains passed each other (7:29).



January 2th 2019 - where



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First information (8:16): due to heavy braking, there may be a few minor injuries in L 210 because of the braking.

Next (about 8:30): Maybe some people seriously injured => decided to deploy immediately (two investigators).

On the way to the accident site: maybe fatalities.

At arrival: 6 fatalities (until now), several injured.

It was quite early clear that the passenger train has collided with a semi-trailer coming from the first twin pocket wagon after the locomotive.



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Freight train (brofæste)



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Freight train (brofæste)



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Freight train (brofæste)



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January 2th & 3th 2019

Because of the storm it was not possible to work safely on the bridge. We started registration of evidence as good as possible.

Rest of the day, evening and night, first the freight train and later the passenger train were transported to a closed area near Nyborg Station.

All night and into the next morning, special police crew (GSU => “crime scene specialists”) worked on the passenger train.

AIB DK had and has a good and close relationship with rescue team, police, Danish Emergency Management Agency (Beredskabsstyrelsen) and Home Guard (Hjemmeværn).

At the same time, I got a lot of emails (and phone calls) from, for example, many of the my colleagues in the Accident Investigation Boards in Europe, offering help - not least from the countries of Nordic cooperation (mail from Norway, Sweden, England and Ireland) and from several of other European AIB’s including Germany.



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January 2th & 3th 2019

HCLJ made agreements with the police in the first hours after the accident on the security and scope of information, for example:

- police photo documentation
- video and photo from the GSU investigations
- technical assistance from NKC (National Forensic Center)
- video and pictures from police helicopter
- registration and later interrogations of passengers from the IC4 train
- guarding the shunting area in Nyborg by police and Home Guard (Hjemmeværn) - the area was protected - both trains were at the area the next 3-5 days.

During the night / in the morning the police found 2 more fatalities:

- 8 fatalities
- 16 injured => 4 serious and 14 minor
[medical assessment]



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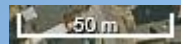
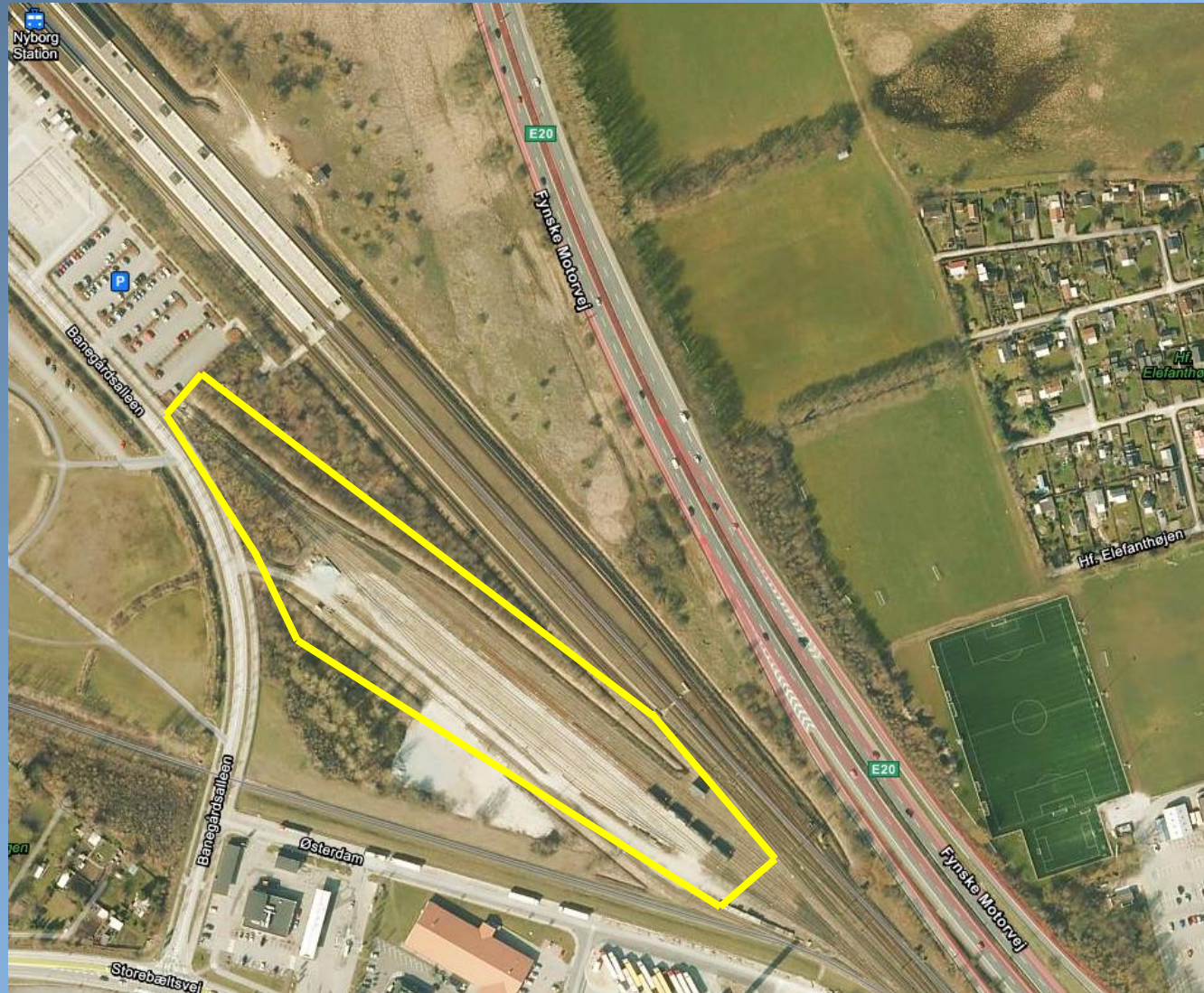
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January 3th 2019



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Organisation of the investigation => a “disaster”

AIB DK has a procedure for handling different levels of accidents:

Omfang	Ansvarlig	Bistand	Niveau	Hjælpeværktøjer	Bemærkning / husk
Ulykke / hændelse	JE		1	B1	brug for hjælp =>
Ulykke	JE + hjælp	JE	2	+ B	anden JE til rådighed anden JE <u>ikke</u> til rådighed eller brug for anden hjælp =>
Større ulykke	JE + hjælp	LE / Sek	3	+ B	hjælp fra LE, sek brug for mere eller anden hjælp =>
Stor ulykke	JE + hjælp	Ekstern faglig bistand (DK)	4	+ B4	specialist eller anden rep. for JE / HCLJ på ulykkessted => fortrolighedserklæring tillæg til fortrolighedserklæring (bemyndigelse / ramme for bistand)
Katastrofe	JE + hjælp	IIC + "projektleder" + evt. bistand (andre NIB)	5	+ B5	declaration of secrecy (UK)
Forudsætning: mindst én JE medarbejder kontaktbar, men ikke nødvendigvis hurtigt fysisk til rådighed					

AIB DK established a “level 5” organisation (disaster) – I will come back to this issue later.

We got many mails especially from other NIBs, offering help / giving informations – also from UK (thanks, Simon!).



Investigations

We knew very early that the trailer has left the pocket wagon and collided with the passenger train.

This was in this situation one area, where we strongly needed competences / assistance:

Freight train, pocket wagons and trailers.

We are a small organisation, and we have very little experience in investigating freight trains, and even less in pocket wagons and saddles.

Gerd Münnich from BEU (Bundesstelle für Eisenbahnunfalluntersuchung) was also so brave to offer help, and BEU has experts with deep knowledge of freight wagons.

We had therefore 2 experienced accident investigators (Michael & Michael) from BEU in Nyborg, who provided valuable assistance in the first technical investigations with us right after the accident.

Representatives from DB Cargo Scandinavia and the wagon owner VTG also participated in the investigations of the pocket wagon and saddle.



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First findings

Friday evening (January 4th): safety deficiencies in the trailer hitch / saddle model FW6170 mounted on the pocket wagon (Sdggmrs) have been discovered => there could be a risk that the locking mechanism was unlocked, even following the procedures from the manufacturer of the railcar trailer hitch =>

- NSA was informed Friday evening by phone, and Saturday by mail.
- Monday 7th: Test (NSA, RU, etc.) confirmed that the suspicion was correct.
- Tuesday 8th: Urgent Safety Warning sent to ERA.
- Several tests on more wagons showed that it seems to be a general problem with this kind of hitch / saddle.
- Question about knowledge about similar accidents or incidents sent (with help of ERA) to other NIBs.
- Update of the urgent Safety Warning sent to ERA (and data entered in the SIS system).



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Preliminary report & findings

March 14th

AIB DK published a preliminary report, describing the accident, investigations until the date, preliminary findings and further investigations.

Preliminary findings.

Even following procedures from manufacturer and from RU, there is a risk the trailer (=> King pin) isn't secured in the hitch / to the wagon => several tests confirmed the findings.

Calculations (DTU) shows that the wind could remove the trailer (if not locked to the hitch).

Later tests confirmed the calculations.

Remark: If the King Pin is correct locked in the hitch, it's possible to lift the whole wagon if the semi-trailer is lifted!



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Investigations (“sub investigations”)

We quite fast made (and expanded) a project organisation within AIB DK, where the investigators was responsible for “their” projects / subprojects, managed by the Investigator In Charge. This involved the whole organisation: railway investigators (RI) and aviation investigators (AI).

To conduct our investigations with as much openness as possible, AIB has involved stakeholders in all the studies and tests where their presence made sense.

Two aviation investigators are still involved in several of the sub investigations, e.g:

- Closer examination of wind forces on the Great Belt Bridge and semi-trailer, including detailed studies, calculations and wind tunnel test => AI leading DTU, Cowi Consult.
- Documentation (hitch and King Pin) before test => AI leading Force Technologies, Danish Technological Institute.
- Investigation of train movement, damages, signaling, etc. => RI leading the process.
- Interview of all involved (trains, handling and loading of trailers, etc. => RI leading the process.



Investigations (“sub investigations”)

- Practical / physical test: is the detailed studies, calculations and wind tunnel test possible in reality? => are the calculated force enough to knock down a corresponding carriage trailer by an identical pocket car? => **AI** leading DTU, operator and stakeholders.
- Approval regime for pocket wagon (Att: undercarriage + 150mm) => **AI** leading private railway consulting company.
- Further technical studies of the equipment involved, e.g. maintenance of king pin hitch (4 / 12 / 48 month?) => ECM regime (certification of entities in charge of maintenance for freight wagons) => **AI** leading private railway consulting company.
- Study of loading regulations and procedures => **RI** leading the process.
- Study of passenger train collision safety (crashworthiness – see later) => **AI** leading the process.
- Etc.



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Investigations

There were another area, where we strongly needed competences / assistance:

Crashworthiness investigation.

To ensure both positive and negative learning in relation to the IC4 train and in respect of the victims, AIB DK decided to conduct an crashworthiness investigation of the IC4 train - to find possible learning points in the short term (IC4 train type itself) and longer term (future train production).

But AIB DK has never made a proper crashworthiness investigation before.

Based on international cooperation we knew that the RAIB (UK) had done several crashworthiness investigation over time, and took contact to the head of RAIB UK: Simon French, who immediately was willing to help.

We made a contract with SNC-Lavalin (Atkins), who should have some of the leading specialists in crashworthiness in Europe.

We had and still has invaluable help from two RAIB inspectors: Winston & Dominique. They were over a long period our advisors, - and Winston was in Denmark several days during the investigation.



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Derailment in Sweden February 6th 2019 (picture from a newspaper)



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Some lessons learnt

- In such a sharp situation: fantastic cooperation between the authorities.
- Great use of our right to draw on other authorities' (specialized - GSU) resources, such as passenger registration, aerial photography, etc.
- Use other investigators (from aviation) to conduct sub-investigations where railway experience is not essential – and a railway investigator has to follow / lead the process (Railway investigator can't be IIC in an aviation accident and reverse).
- **So:** it is important to state that only a Railway Investigator can be Investigator in charge (IIC) on a rail accident investigation, but investigators from Aviation can be great assistance / help - and vice versa.

And especially if you are a small AIB / NIB like us:

- Accept (where it make sense) assistance from colleagues / other AIB.
- Use all the external specialists / companies where it are possible, makes sense or / and can relieve the pressure.



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Some lessons learnt

- Involve stakeholders where it makes sense, either directly in the investigations under the direction of AIB or as observers (=> Declaration of secrecy).
- From the start, the IIC must be ensured opportunities to carry out the overall management of the investigation - and for example be kept as much free from media service as possible.
- We could benefit from involve our entire organization (primarily aviation investigators) earlier than we did here.



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Right now

Almost all sub-investigations have been completed and report writing is happening right now, but we are still working to get completed and finalized the last few tests, calculations and analyzes.

As far as possible, an investigation must be completed within 1 year – and we are working hard to try to fulfill this (no promises at this stage....).

Questions?



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