Communication under high task load
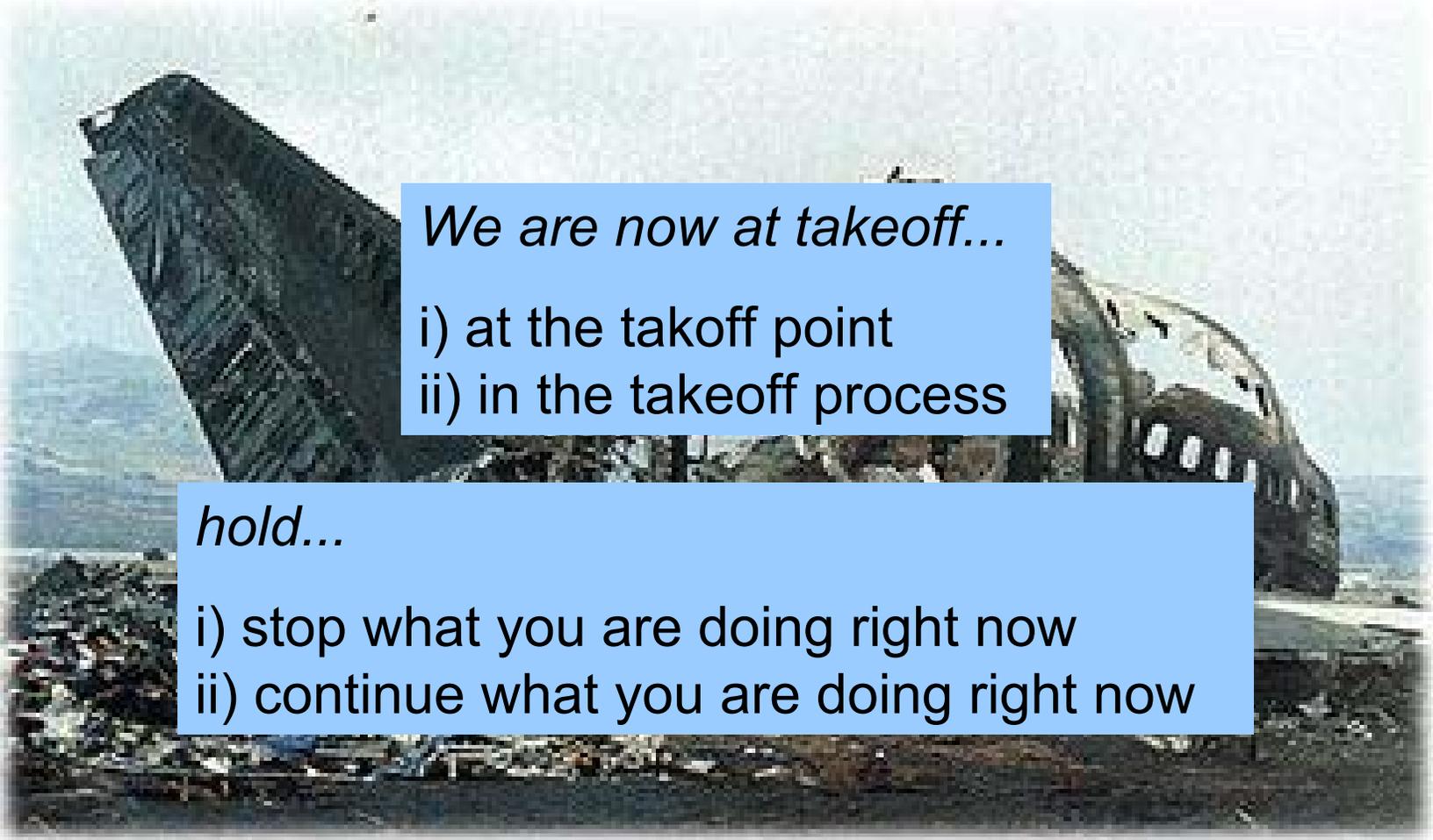
We are now at takeoff...

i) at the takoff point
ii) in the takeoff process

hold...

i) stop what you are doing right now
ii) continue what you are doing right now

fire in *Kaiserstrasse* ==> fire in *Königsstrasse*

My husband doesn't *live* anymore ==>
      My husband doens't *love me* anymore.

"Due to a damaged rudder, a liquid butane ship has hit a tank ship full of vinyl chloride on the front broad side above the water line and rammed a hole in it. Vinyl chloride is leaking out. Acute danger of fire and explosion due to outflow of gas cloud."
vinyl chloride ==> chlorine gas

Measures taken:

- **Standardization of language.**

- **Improving strategies of language use.**

High Level of Standardization in Aviation:

International Civil Aviation Organisation -- ICAO

Garuda Indonesia Airways flight GA 152 arriving from Jakarta Indonesia on September 26, 1997; Phase: Initial approach to Medan (Indonesia) Airport

MEDAN: GIA 152, maintain 3000ft for a while. Maintain heading Medan VOR. Traffic now still taxi Runway 23. [ATC; COMMAND]

GIA 152: Maintain 3000. [Cockpit; CONFIRM by READ BACK]

MEDAN: Merpati 152, you turn left heading 240 vectoring for intercept ILS Runway 05 from right side. Traffic now rolling. [ATC; COMMAND]

MEDAN: GIA 152 do you read? [ATC; QUESTION; ,read' ~ hear, receive]

GIA 152: GIA 152, say again? [Cockpit; REQUEST]

MEDAN: Turn left heading a ...... 240, 235. Now vectoring for intercept ILS Runway 05.

GIA 152: Roger, heading 235. GIA 152. [Cockpit; EXPLICIT CONFIRM + READ BACK]

GIA 152: GIA 152 heading 235. Confirm we cleared from a ..... mountainous area? [Cockpit: REQUEST]

MEDAN: Affirm sir! Continue turn left on heading

Low Level of Standardization in Medicine

Situation: Operation.

Participants: Operating surgeon (COP), Assistant (AST); Actual task: The opening of the thorax from the position of the sixth rib

(1)   cop   a) das hier is die sechste rippe. (*this here is the sixth rib*)

                            b)   und danach gehste rein mit dem (...) ICR Thorax.
                                    (*and then go in with the ICR Thorax*)

(2)   ast   also (.) hier (.) drauf; (*then (.) here(.) on that,*)

(3)   cop   na auf der hier (*well, on this here*)

(4)   ast   o.k. und das hier rein? (*okay, and then in this here?*)

(5)   cop   da rein.(*in there*)

(6)   ast   gut. (.) bitte elektrisch- (*good (.) please electrical-*
                                  [electrical coagulation to cut through the tissue and,
                                  at the same time, to close the vessels])

(7)   cop   pass auf (.) und jetzt machste[=so=d]ass de n bisschen-
                                (*watch out (.) and now you do it so that you. . .a little. .*)

(8)   ast   [=ja=a=] (*yes*)

(9)   cop   am oberrand mehr oder- (*more on the upper edge, or-*)
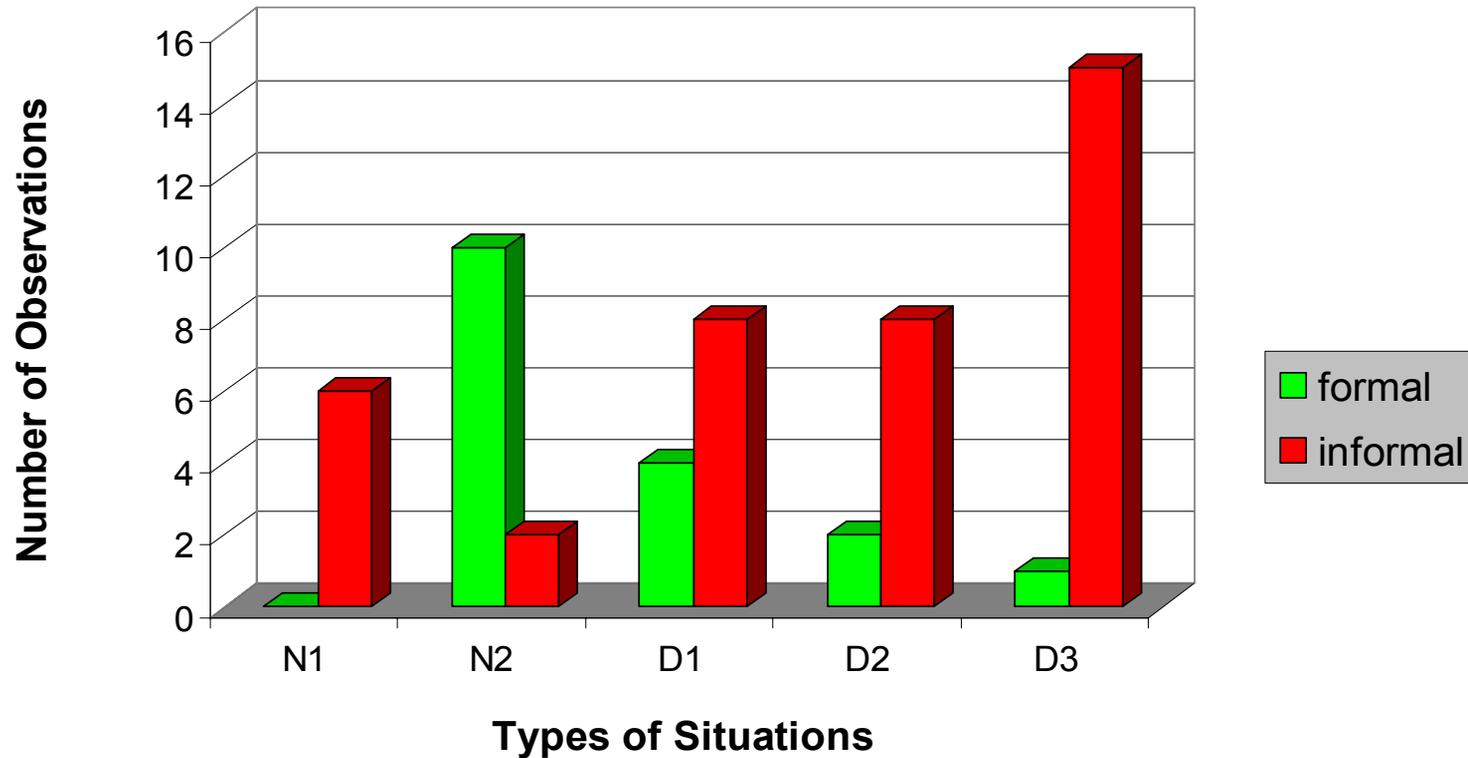
Proportions of utterance per Register and Situationtype

Japan Airlines flight 123 in 1985

CPT: Nose down. Lower nose.
F/O   Yes, sir.
CPT: Lower nose.
F/O: Yes, sir.
CPT: Lower nose.
F/O: Yes, sir.
CPT: Stop saying that. Do it with both hands, with both hands.
F/O: Yes, sir.

The use of standard wording by the captain was clearly negatively related to performance. A possible reason is that standard wording, despite its benefits, can be used to mask communication deficiencies.

(Krifka, Martens & Schwarz (in print))

A study of 71 Runway-incursion Occurrences world-wide:

"Crew communication – such as improper readback, mishearing and/or improper phraseology – was a factor in 31 percent occurrences."

Recommendation:

"Require the use of ICAO standard phraseology by ATC and aircraft crews. Aircraft crews should read back clearances including call sign and runway designator, and controllers should challenge incorrect/incomplete readbacks."

(Kwata 2002; Flight safety foundation News March 21, 2002):

Conclusion from GIHRE-Results

Use standard patterns of interaction especially in team external communication.

Repeat, confirm the information addressed to you or at least let the sender know that you could not 'read' his message due to workload or other intervening factors.

What should team-members do to minimise the risk of failure under the pressure of unexpected high task load

?

➢ Tune down their communication activities and concentrate on their primary task

➢ or try to go on with communication and, thereby, risk severe detriment to the performance in their primary task?

15.33:26	ACO	Two hundred. (Automatic altitude Control)
	Tower	<Radio communication with an other airplane in Polish>
15.33:29	PNF	Von rechts kommt jetzt - . (Here comes [the windshear] from the right ---
15.33:31	PF	Jetzt kommt die windshear. (Here comes the windshear.)
15.33:33	ACO	One hundred.
15.33:36	PNF	Dreht, dreht (turning, turning)
15.33:37	ACO	Fifty.
15.33:39	ACO	Thirty.
15.33:40	ACO	Retard, retard.
15.33:45		<Clack>
15.33:49	PF	Brems mal mit. (Help me with the brakes!)
15.33:52	PF	Full braking.
15.33:56	PNF	Reverse auf? (Reverse up?)
15.33:57	PF	Ja´s voll. (Yes, full reverse thrust.)
15.33:58		<Clack>
15.34:01	PNF	Hundert. (One hundred [meters away from the end of the runway])
15.34:02	PF	Weiter bremsen. (Keep braking])
15.34:05	PF	Scheiße. (Shit)
15.34:06	PF	Was machen wir jetzt? (What now?)
15.34:08	PNF	Tja, du kannst nix mehr machen. (Well! There is nothing to do.)
15.34:10	PF	Ich möcht nicht da gegen knallen. (I don't like to crash against this wall.)
15.34:11	PNF	Dreh´n weg. (Turn it aside.)
15.34:12	PF	Was? (What?)
	PNF	Dreh ihn weg. (Turn it aside.)
15.34:16	PF	Scheiße!
15.34:17		<Krachen>

Team members speak simpler under conditions of high task load.

Under the same dual task conditions, yes/no-questions are less impaired than wh-questions when cognitive demands increase, such as the amount of knowledge or the working memory load, involved into the question-answering task .

There were more utterances per minute in the segments of high workload, and the utterances were longer, leading to a substantial difference of speech time per minute.

Good teams speak more.

**Crews whose members communicate
their intentions of what they are planning
to do next more frequently achieve better
scores in flying their planes.**

Reports of Intention per Thought Unit
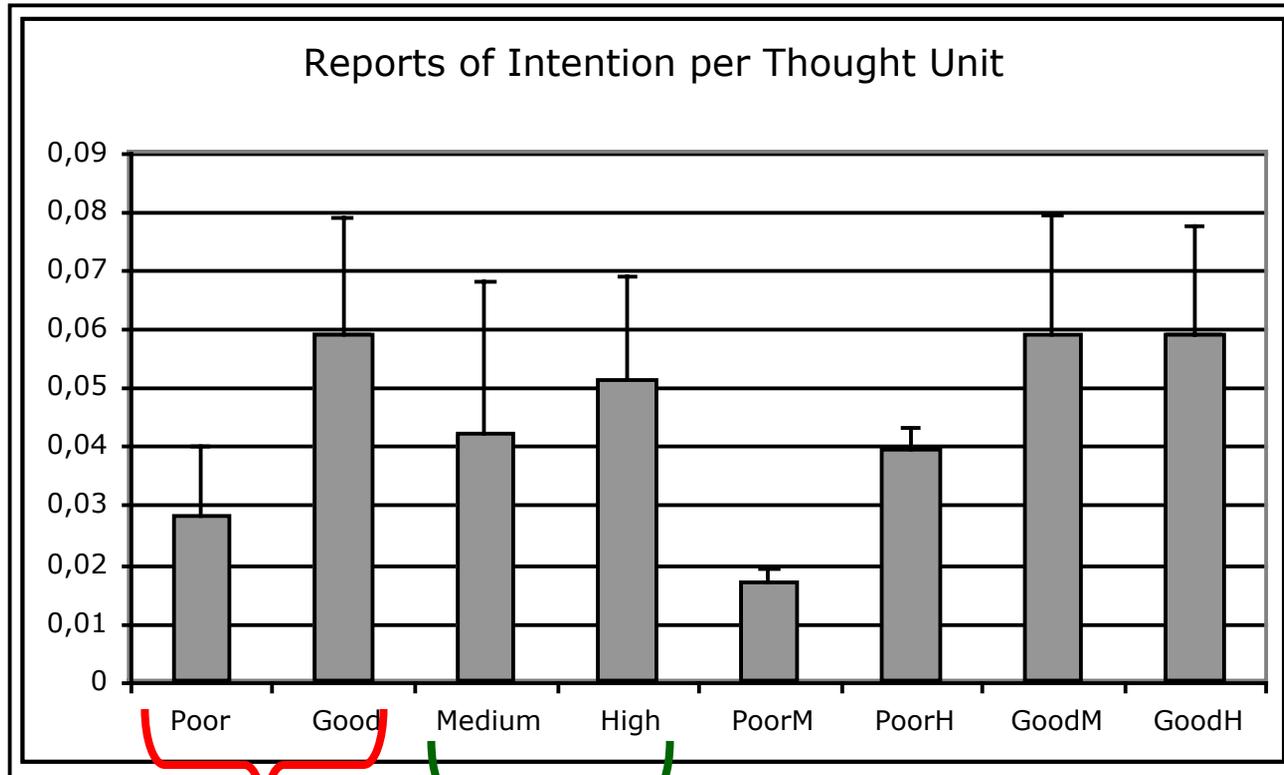
Poor vs. good crews

Medium vs. high task load

Under conditions of high workload the proportion of problem solving utterances of the captain is significantly higher in good teams than in poorly perfoming teams
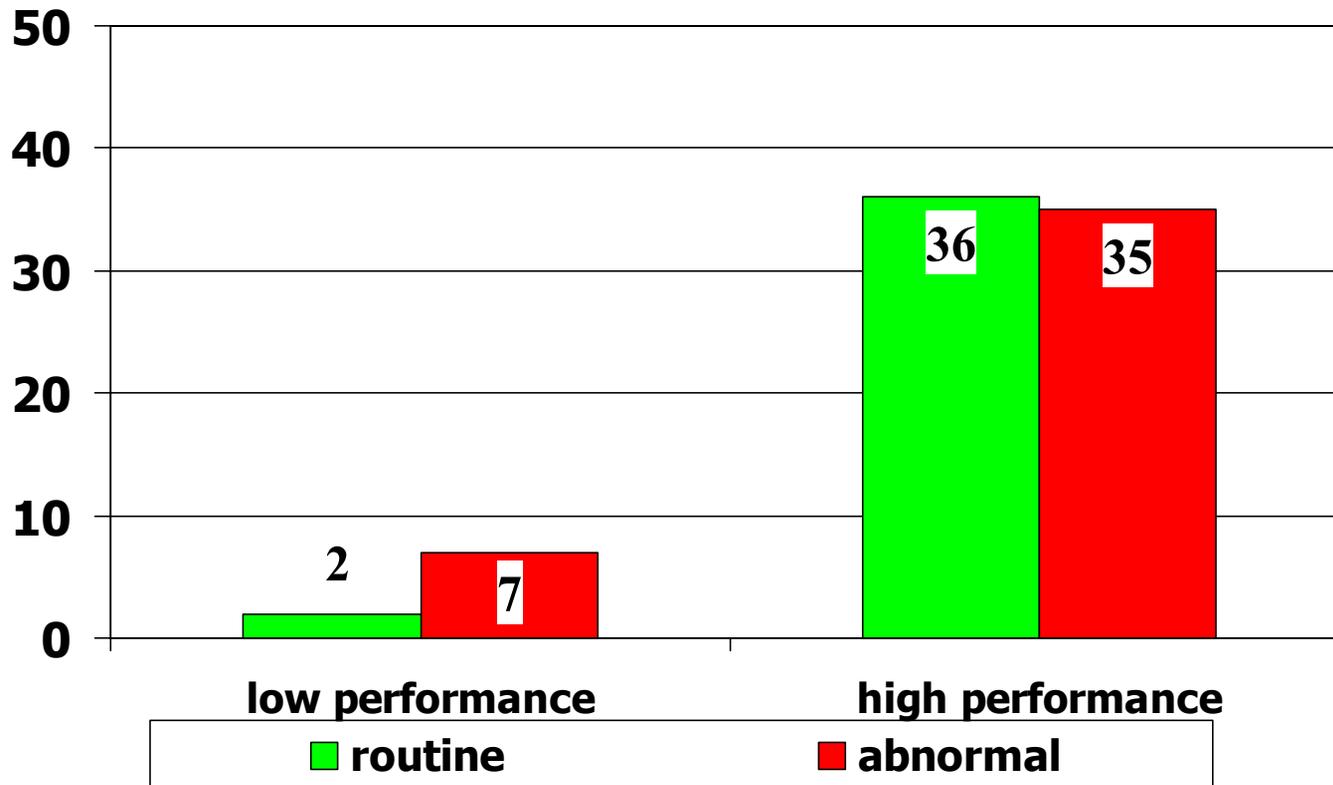
Captain problem solving utterances by workload and performance

Summary

➤ **Standardisation** of phraseology was not observed to be correlated to errors or more severe events (incidents, accidents) in high risk environments.

➤ The efficiency of **team external communication** is improved by standard communication formats, feedback and redundancy.

An increase in task load makes a team change the communication strategies.

➢ Simpler linguistic means are used.
➢ Good teams communicate more than poor performing teams inspite of the resulting additional cognitive costs.
➢ Good teams perform more positive speech acts of agreement or negotiations and more speech acts that initiate the other team members' cognitive resources for problem solving.