



NTSB National Transportation Safety Board

Managing Fatigue in 24/7 Ops: Lessons Learned from Transportation

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UNITED STATES CODE, TITLE 49
CHAPTER 11—NATIONAL TRANSPORTATION SAFETY BOARD

SUBCHAPTER 1—GENERAL

Sec.
1101. Definitions.

SUBCHAPTER 2—ORGANIZATION AND ADMINISTRATIVE

1111. General organization.
1112. Special boards of inquiry on air transportation safety.
1113. Administrative.
1114. Disclosure, availability, and use of information.
1115. Training.
1116. Reports and studies.
1117. Annual report.
1118. Authorization of appropriations.

SUBCHAPTER 3—AUTHORITY

1121. General authority.
1122. Civil aircraft accident investigations.
1123. Review of other agency action.
1124. Inspections and audits.
1125. Secretary of Transportation's responses to safety recommendations.

SUBCHAPTER 4—ENFORCEMENT AND FINALITIES

1131. Aviation enforcement.
1132. Injurer and intervention in aviation proceedings.
1133. Judicial review.
1134. Discovery and use of cockpit voice and other material.
1135. Aviation penalties.

SUBCHAPTER 5—GENERAL

§1181. Definitions

Section 40102(a) of this title applies to this chapter.

SUBCHAPTER 6—ORGANIZATION AND ADMINISTRATIVE

§1183. General organization

(a) ORGANIZATION.—The National Transportation Safety Board is an independent constitutional body of the Government.

(b) APPOINTMENT OF MEMBERS.—The Board is composed of 5 members appointed by the President, by and with the advice and consent of the Senate. Not more than 3 members may be appointed from the same political party. Members shall be appointed on the basis of technical qualification, professional standing, and demonstrated expertise in accident reconstruction, safety engineering, human factors, transportation safety, or transportation regulation.

(c) TERMS OF OFFICE AND REMOVAL.—The term of office of each member is 7 years. At the end of the term, the President may appoint a member to fill a vacancy occurring before the expiration of the term for which the predecessor of that member was appointed for the remainder of that term. When the term of office of a member ends, the President may reappoint a member if the member is appointed and qualified. The President may remove a member for inefficiency, neglect of duty, or other cause in office.

(d) CHAIRMAN AND VICE CHAIRMAN.—The President shall designate, by and with the advice and consent of the Senate, a Chairman of the Board. The President also shall designate a Vice Chairman of the Board. The terms of both the Chairman and Vice Chairman are 2 years. When the Chairman is absent or unable to perform the duties of the office, the Vice Chairman shall perform the duties of the office.

Mission

The NTSB is charged with:

- 1) determining the probable cause of transportation accidents
- 2) making recommendations to prevent their recurrence



The NTSB is Responsible for Investigating:

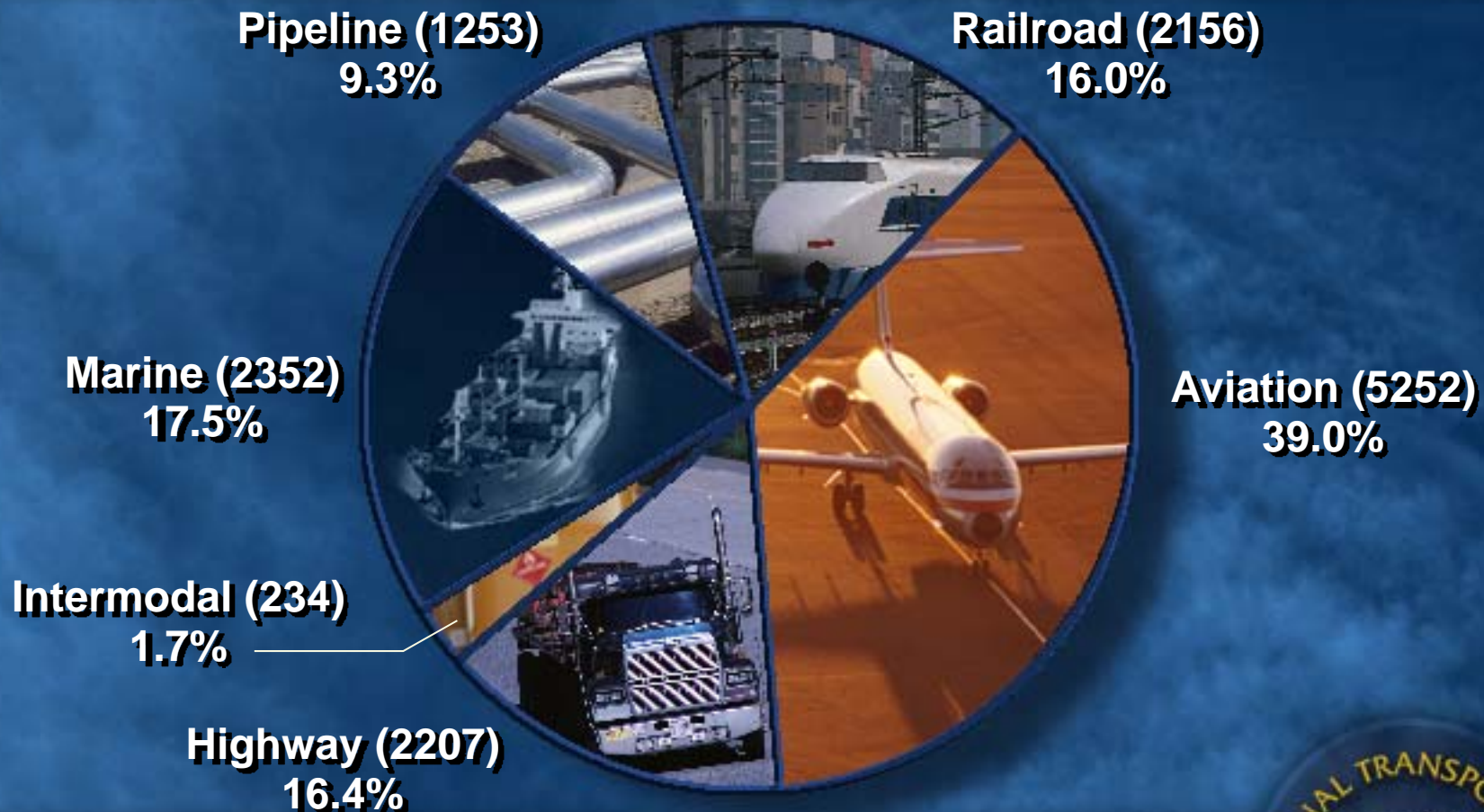
**Aviation, highway, rail, marine, pipeline,
and hazardous material accidents**





- 130,000+ accident investigations
- 13,000+ safety recommendations
 - 82% acceptance rate

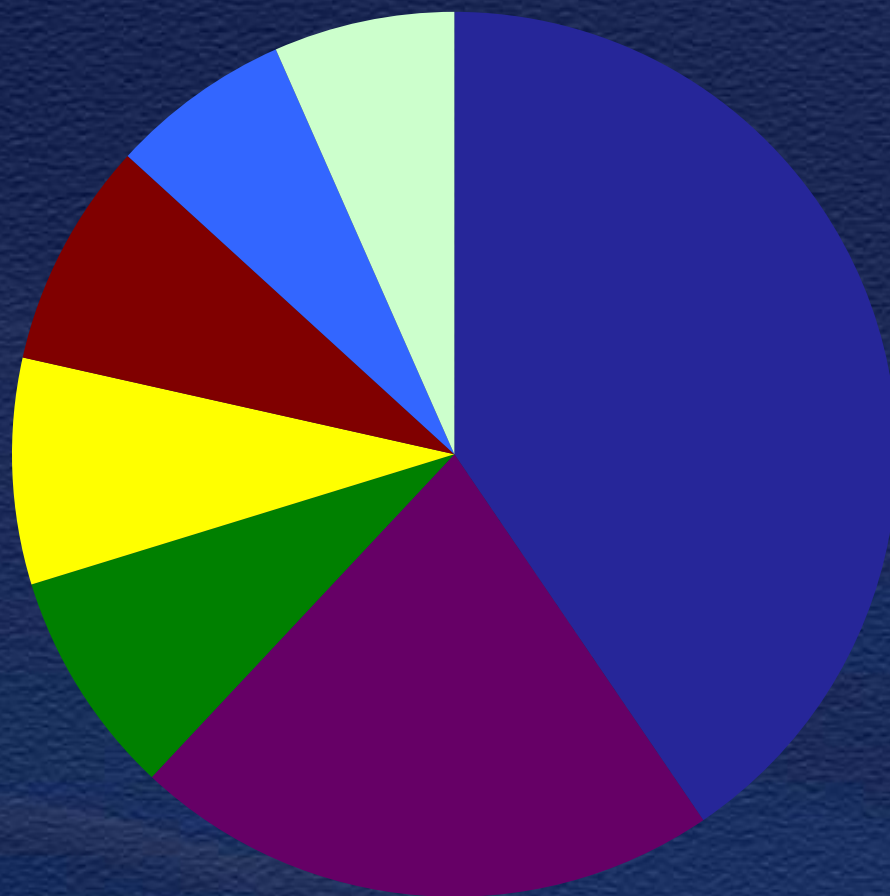
13,454 Safety Recommendations issued since 1967



NTSB Fatigue Recommendations

- MOST WANTED since 1990
- ~200 fatigue recommendations

Complex Issue: Requires Multiple Solutions



- Scheduling Policies and Practices
- Education
- Organizational Strategies
- Raising Awareness
- Healthy Sleep
- Vehicle and Environmental Strategies
- Research and Evaluation



Major product: safety recommendations

Moral compass and industry conscience

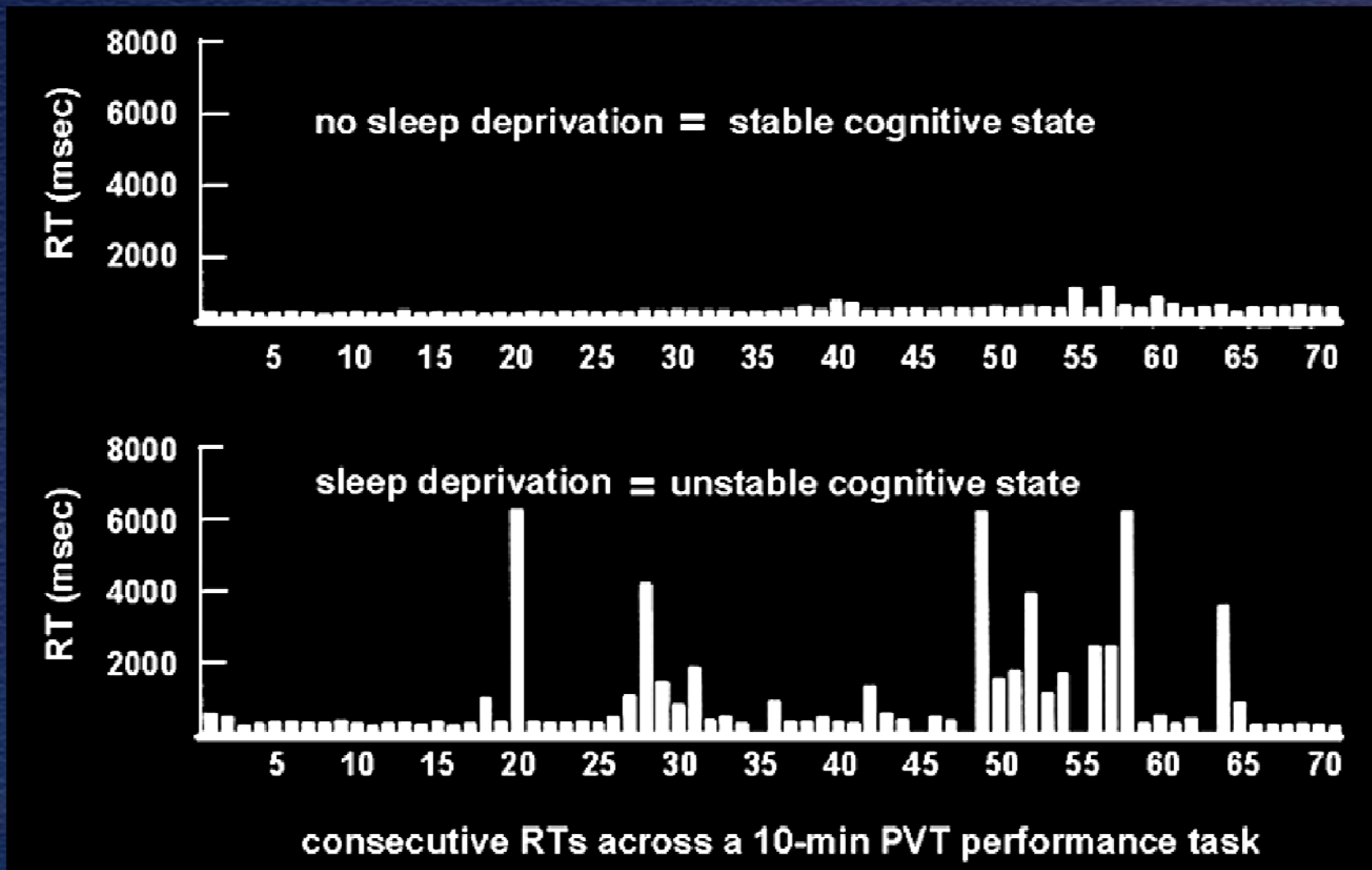
Fatigue Risks

Fatigue can degrade
every aspect of
human capability.

Fatigue Risks

- reduced (20 – 50%+):
 - reaction time
 - memory
 - communication
 - situational awareness
 - judgment
 - attention
 - mood
 - more . . .
- increased:
 - irritability
 - apathy
 - attentional lapses
 - microsleeps

Fatigue and Reaction Times



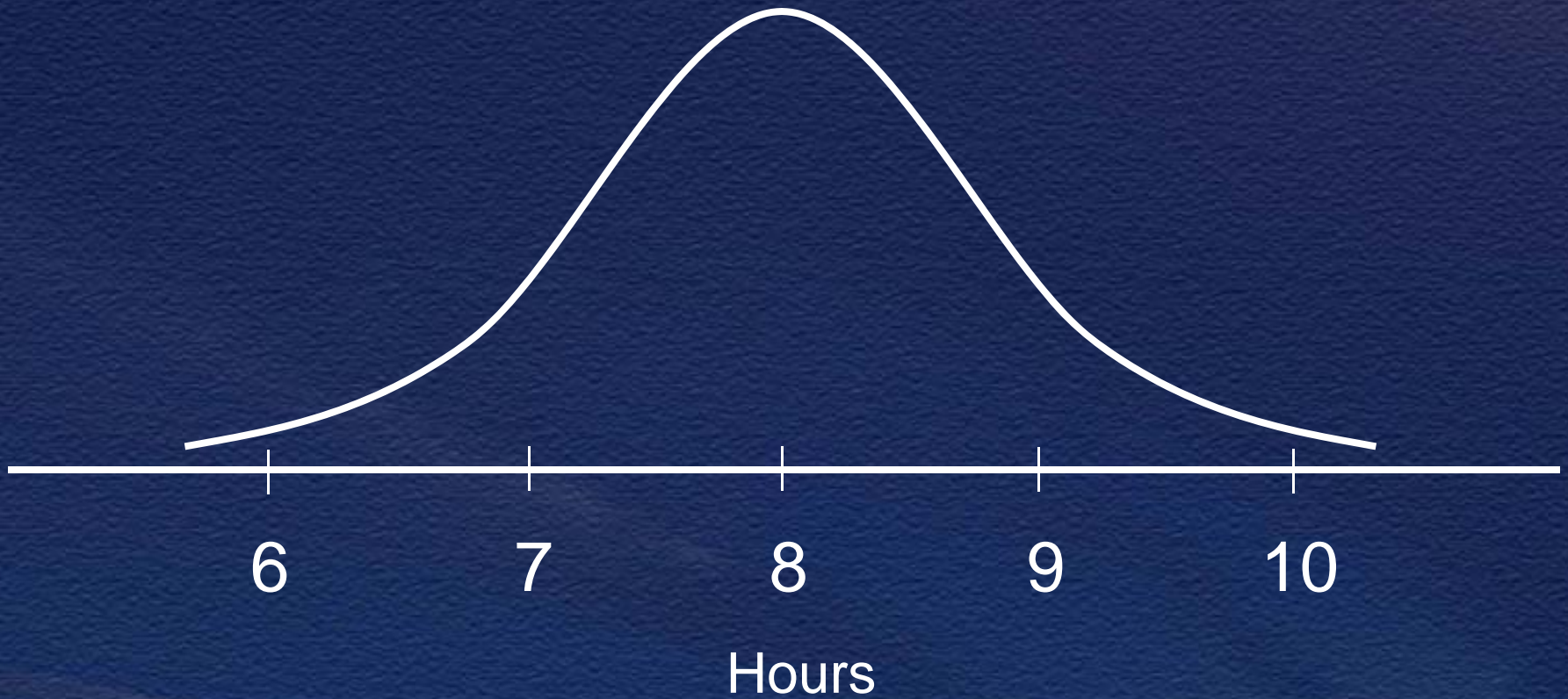
Doran SM, Van Dongen HP, Dinges DF. Sustained attention performance during sleep deprivation: evidence of state instability. *Archives of Italian Biology: Neuroscience* 2001;139:253-267.



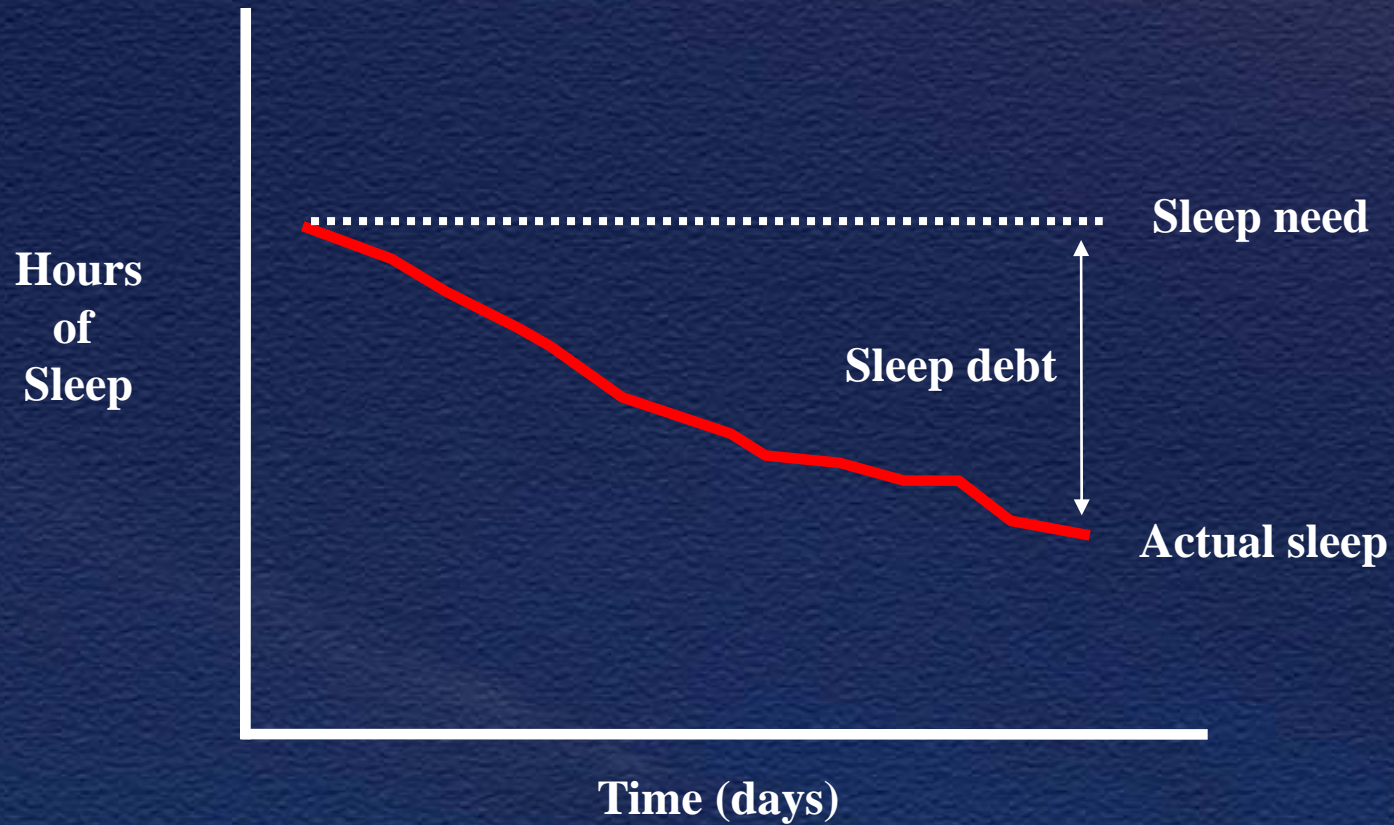
Fatigue Factors

- sleep
- circadian clock
- hours awake
- sleep disorders

Sleep Requirement



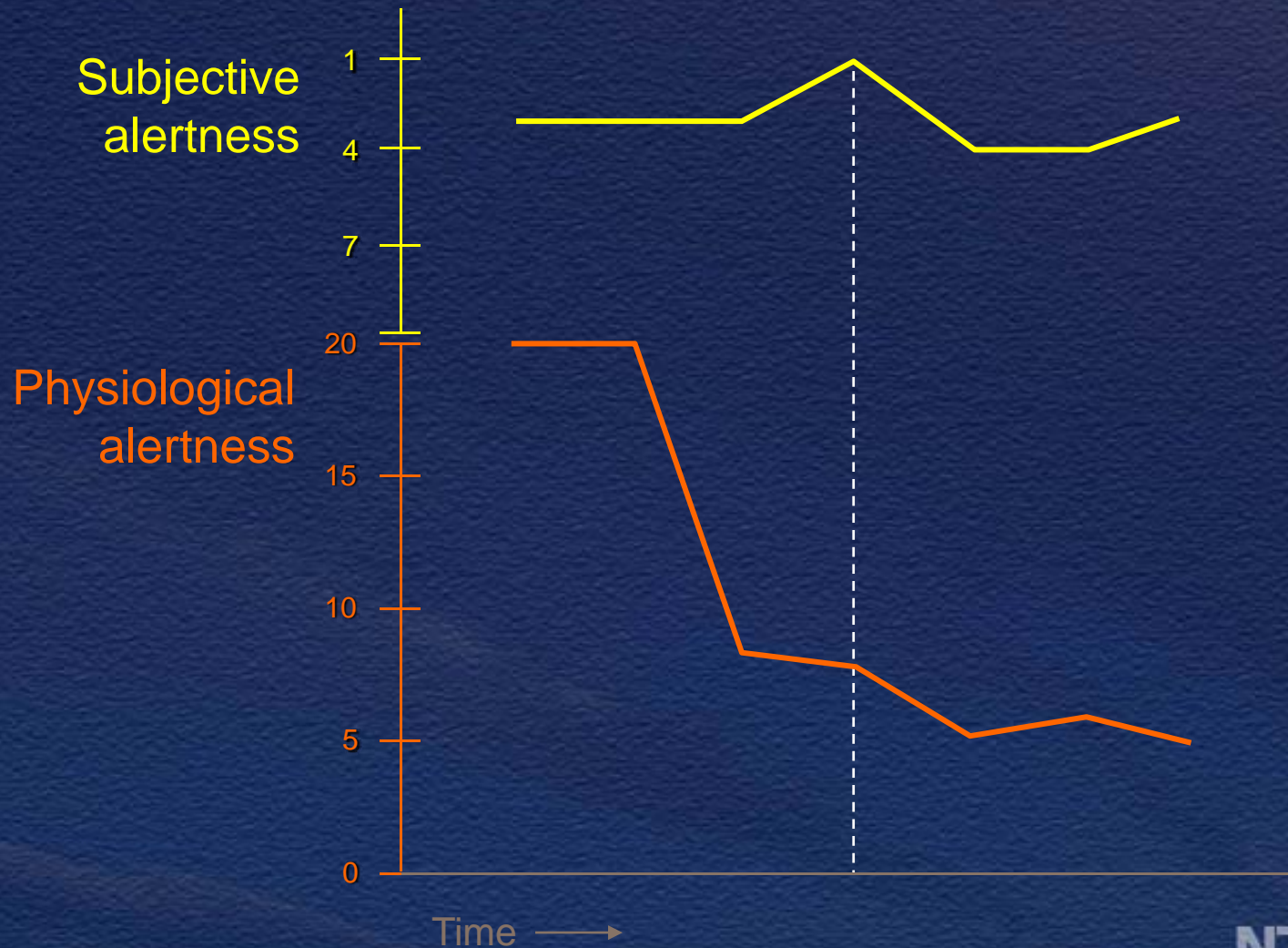
Cumulative Sleep Debt



Sleep Need – Actual Sleep = Sleep Debt

Sleep debt grows cumulatively over time

Alertness Reports Often Inaccurate



Adapted from Sasaki et al., 1986

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