Why do near miss incidents cause a serious problem in aviation?

An airprox/near miss/air miss/near collision/close call is loss of safe longitudinal, vertical, lateral or time separation between aircraft during the flight. It's a situation when two aircraft almost collide. As a rule a near miss doesn't result in injuries, illness of the occupants or damage of the aircraft and equipment but potentially it can occur at all times (any time) . If it happens the crews will experience technical, communication, navigation, medical and other problems. And what is more , in the worst case an air miss can develop into mid-air collision. I can recall /remember a terrible accident when Bashkirians Airlines flight and DHL flight collided killing all the passengers and crew of both aircraft. So, I believe that any near miss incident is serious issue in aviation, so it must be reported and investigated.

- ***What are possible reasons for a near miss?***

It can happen due to technical malfunction (engine failure, decompression, fire on board ...) or due to hazardous weather conditions: thunderstorms, severe turbulence, icing. These are situations when the aircraft is unable to maintain assigned FL. Also an AirProx may be a result of a Level Bust (vertical deviation of more than 300 feet) when an aircraft doesn't stop at the cleared flight level and continues to climb or on the contrary loses the altitude. Such cases are possible due to pilots' distractions and errors. Besides controllers may give pilots wrong instructions. Actually fatigue, high workload, stress or misunderstanding can cause a near miss incident.
One more reasons is Airspace Infringement. It's a situation when an aircraft enters the airspace without clearance from the controlling authority.

- ***How can misunderstanding between controllers and pilots lead to a near miss?***

When controllers give ambiguous and long instructions, when they speak very quickly and with strong accent or deviate from RTF pilots may confuse, read back incorrectly the cleared FL. If the controller fails to (doesn't) detect/catch readback error the pilot can take the wrong altitude and get close to another aircraft.

- ***What equipment helps pilots to keep situational awareness?***

Most aircraft have onboard equipment which warns of potential collision with other aircraft. **ACAS**- Airborne Collision Avoidance System or **TCAS**- Traffic alert and Collision avoidance System. The system issues two types of alerts: **TA**-traffic advisory and **RA**-resolution advisory. RA advises the pilot to climb or descend to avoid collision. In such a case controllers don't interfere with pilots actions, they just confirm (saying "Roger") and wait until the pilot reports "clear of conflict". As for TA, it informs pilots of a potential conflict.

- ***Aircraft not equipped with transponders?***

As far as I know, a transponder is mandatory on every engine airplane (since 2006) (every engine aircraft must have a transponder). As for light aircraft, helicopters, gliders and UAVs (unmanned aerial vehicle) (drones) , most of them have private/personal electronic devices – FLARM (Flight Alarm). This technology alerts pilots of both aircraft of possible/potential collision, so pilots can take timely actions to avoid it. But still, if there isn't such a device on board the aircraft (if the aircraft doesn't have such a device) the controller will not be able to identify it and it can lead to a near miss and further negative consequences. It's rather dangerous/challenging. Besides TCAS is based on the aircraft transponder. If there is no transponder then there is no TCAS on board the aircraft. It might be a threat for flight safety too.

- ***Why is it necessary to inform pilots about military flights in the area?***

During the activities the Air Force uses (their) own rules and procedures. For example, they fly at higher speed, they leave one FL for another one (change FLs) very quickly, they use other separation minima . When civil pilots have information of military flights they will choose safe routes, they will not approach or enter the restricted area. In all, it's necessary to prevent near miss incidents and to ensure/provide the safety of flight operations.

- ***Is there any equipment that alerts controllers to a potential conflict between aircraft?***

We have hi-tech computers [it's a Short-Term Conflict Alert (STCA) system], they analyze movement of all aircraft in the area and help controllers to forecast conflict between them. If a computer detects a potential conflict the color of the flight label changes from white to yellow and red if separation gets unsafe/less. Also controllers receive a sound alert.

- ***Do pilots and controllers file reports in case of a near miss?***

Initially, if possible, pilots should report a near miss incident immediately or a bit later to ATCO using RTF, the ATCO in his turn will report details to the appropriate unit/authorities. But in all cases after landing pilots and controllers will file a full near miss written report (in writing) (air traffic incident report). It's necessary for safety reasons as any unsafe conditions and unsafe acts can result in accidents and injuries.

- ***What information is included in a near miss report?***

The near miss report should include aircraft call sign, flight number, position of the airprox, date and time (UTC) , FL or altitude, aircraft position and avoiding actions: climbing, descending, turning, injuries if any; also pilots should give description of another aircraft: type, registration, markings, special sings, it's maneuvers.

- ***Why is it necessary to investigate a near miss incidents?***

Investigation of near miss incidents will help aviation specialists to determine the reason, for example: faulty procedures, non-compliance with procedures, equipment breakdown or a human factor. It will give a chance to prevent/avoid them in the future and provide safety of flights.

- ***What are the ways of preventing near miss incidents?***

First of all, aviation authorities must take strong measures against such events. They should organize better training and examination both for pilots and controllers. Also they should improve technology and apply/implement sophisticated (on board and ground-based) equipment which warns of a potential conflict. Besides it's necessary to have better coordination between neighboring sectors.

For their part to prevent air proximity controllers should (for our part we should):

- speak clearly and use standard phraseology
- react correctly and timely
- monitor traffic situation non-stop

- ***Have you ever had/heard about a situation connected with loss of separation?***

Fortunately, we have never had such situation in our control center. But from time to time we receive examples of loss of separation between aircraft in different centers. We learn and analyze all the near miss incidents . One such incident happened in summer over Rostov. As far as I remember, departing A320 and arriving Boeing777 were involved, they got close to each other. Controllers managed to prevent collision when the separation between them reduced up to critical 150m. Finally, it ended happily. (turned out fine) (everything went well) (all was well). No damage to aircraft or injuries were reported. But, if I'm not mistaken, the controller was discharged (was fired, was sacked).